CityZEN Strategy Plan # 6: Roeselare Belgium.

Keeffe, G. (Designer), Martin, C. L. (Designer), Pulselli, R. (Developer), van den Dobblesteen, A. (Designer), Vandevyvere, H. (Designer), & Boersma, S. (Designer). (2018). CityZEN Strategy Plan # 6: Roeselare Belgium.. Design

City-zen 'Roeselare' Roadshow

Een Duurzame Stadsvisie

MIROM MILIEUZORG ROESELARE EN MENEN · inagro ONDERZOEK & ADVIES IN LAND- & TUINBOUW · vrp Flemish Association for Space and Planning · VUB VRIJE UNIVERSITEIT BRUSSEL · vvsg · katholieke hogeschool vives associatie KU Leuven · wvi linkt gemeentes

ROESELARE IS 'M VOOR JOU · DE KLIMAATSWITCH RSL 180 #VANRSL

CITY-zen New urban energy ROADSHOW

ROADSHOW METHODOLOGY : Prof. Dr. Craig Lee Martin, TU Delft, The Netherlands

Roeselare, Belgium. April 2018

‘Co-creation’ & ‘Synergy of Solutions’

Aim: Zero-Energy

Heart of process

Co-creation

Fun / Reachable

CITY-zen
New urban energy
ROADSHOW

ROADSHOW METHODOLOGY : Prof. Dr. Craig Lee Martin, TU Delft, The Netherlands

Roeselare, Belgium. April 2018

What went on ...

Maandag 23 april | Introductie

9.30 u. - 11.30 u.: 'Het loopt op wieltjes'-fietstocht*

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CITY-zen
New urban energy

What went on ...

Maandag 23 april | Introductie

13.30 u. - 15.30 u.: Inspirerende presentaties #VANRSL

CITY-zen
New urban energy

ROADSHOW METHODOLOGY : Prof. Dr. Craig Lee Martin, TU Delft, The Netherlands

Roeselare, Belgium. April 2018

What went on ...





Dinsdag 24 april | Toekomstbeelden

Fun-shops 'Buurten van de Toekomst' & 'Energie'

CITY-zen New urban energy ROESELARE

What went on ...

Donderdag 25 april | Evalueren

Fun-shops 'Buurten van de Toekomst' & 'Energie'

CITY-zen
New urban energy

What went on ...

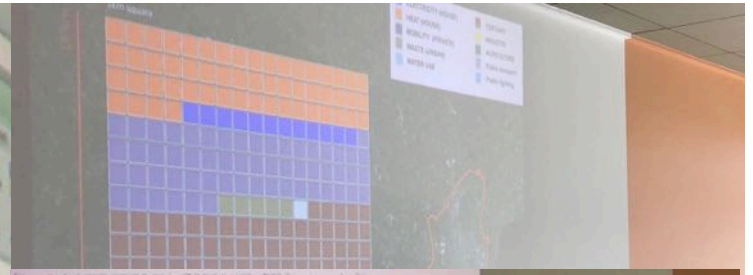
Woensdag 25 april | Design

9 u. - 12.30 u.: Serious Game ‘Go2Zero’

CITY-zen
New urban energy
ROADSHOW

What went on ...

Carbon Footprint	ENERGY	MOBILITY	WASTE	WATER	TOT kg CO2-eq /yr	Ha forestland
John	3,739	2,981	278	57	7,055	0.32
Bert	2,812	426	476	97	3,810	0.28
Janne	3,018	0	476	97	3,591	0.27
Timo	1,914	213	476	97	2,700	0.20
Sybil	2,131	852	594	122	3,699	0.27
0	0	0	0	0	0	0.00
0	0	0	0	0	0	0.00
0	0	0	0	0	0	0.00
0	0	0	0	0	0	0.00
0	0	0	0	0	0	0.00
0	0	0	0	0	0	0.00



Woensdag 25 april | Design

13 u. - 14.30 u.: Mini-masterclass C02-voetafdruk en de stappen die we moeten zetten

CITY-zen
New urban energy
ROADSHOW

ROADSHOW METHODOLOGY : Prof. Dr. Craig Lee Martin, TU Delft, The Netherlands

Roeselare, Belgium. April 2018

What went on ...

Woensdag 25 april | Design

14.30 u – 17.00.: VRP Urban Design Session - Vlaamse Vereniging voor Ruimte en Planning: VRP

ROADSHOW METHODOLOGY : Prof. Dr. Craig Lee Martin, TU Delft, The Netherlands

Roeselare, Belgium. April 2018

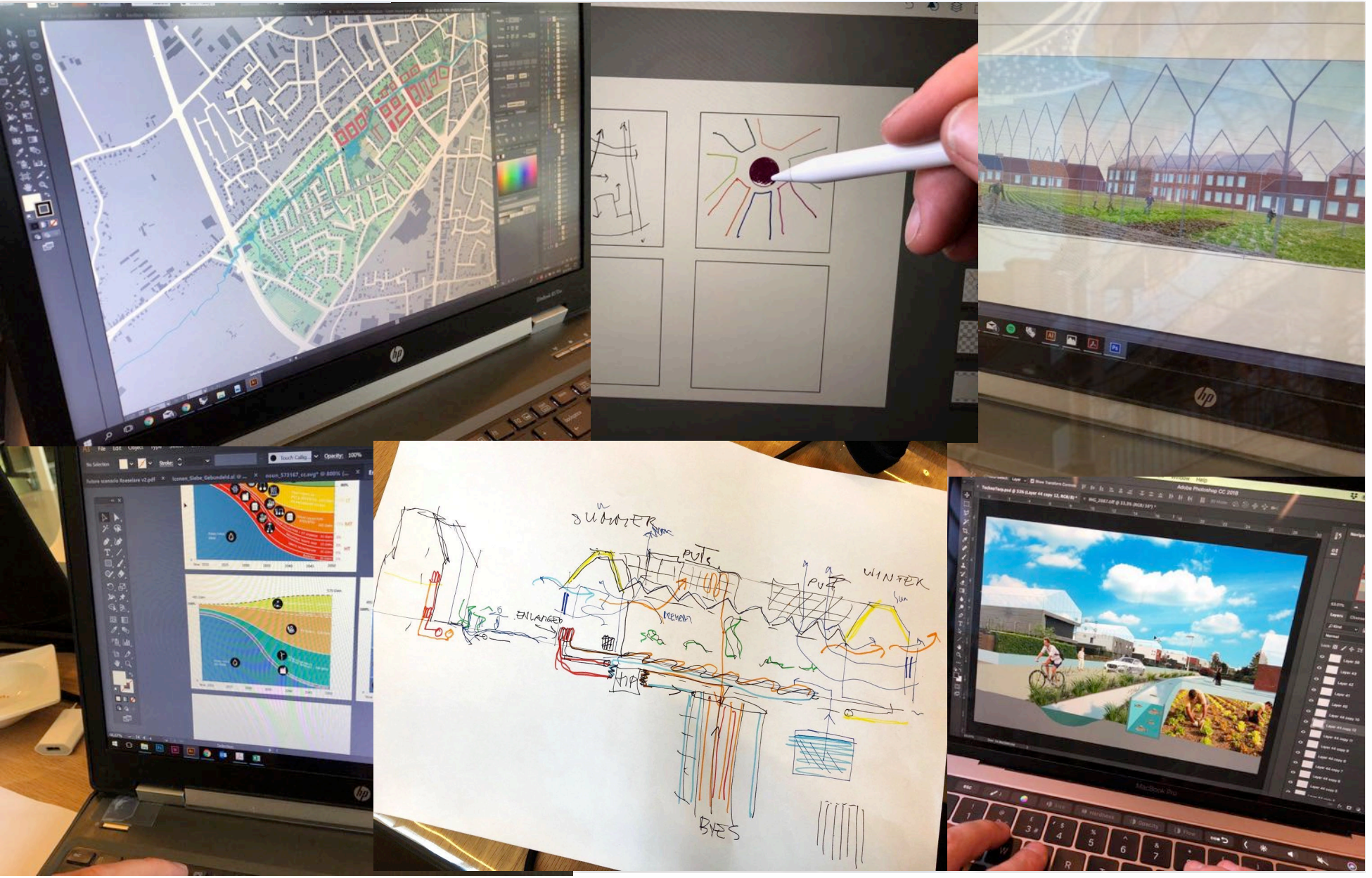
What went on ...

Donderdag 26 april | Evalueren

fun-shops 'Buurten van de Toekomst' & 'Energie'

CITY-zen
New urban energy

What went on ...



Donderdag 26 april | Evalueren

fun-shops 'Buurten van de Toekomst' & 'Energie'

CITY-zen
New urban energy

Vrijdag 27 april | Outro

10 u. - 11 u.:
Een duurzame stadsvisie #VANRSL met de Roadies

11 u. - 12 u.:
Roadshow discussie & Food for thought

CARBON ACCOUNTING EXPLANED

CO_2-eq

UNIT kg CO_2-eq

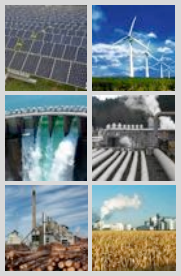
GWP CO2 = 1

GWP CH4 = 34

GWP N2O = 298

EMISSION FACTOR

Emission Factor of Electricity Grid Mix in Belgium



BELGIUM 2016	LCA based EF	DATA	%	GHG EMISSION
GENERAL DATA	kgCO2/kWh	kWh	%	kt CO2-eq/yr
ELECTRICITY DEMAND	_	8.35E+10		
ELECTRICITY PRODUCTION	_	7.98E+10		
INPORT	0.46	3.65E+09	4.4%	1.68E+09
TERMO-ELECTRICITY		2.31E+10	29.0%	1.03E+10
natural gas	0.443	2.31E+	29.0%	1.03E+10
petrolium products	0.778			0.00E+00
coal	1.050			0.00E+00
RENEWABLES		1.43E+10	17.9%	2.14E+08
solar thermal				
Solar PV	0.032	2.95E+09	3.7%	9.45E+07
wind	0.010	5.11E+09	6.4%	5.11E+07
hydro	0.012	3.19E+08	0.4%	3.83E+06
geothermal				
biomass				
biogas	0.011	5.91E+09	7.4%	6.50E+07
hydrogen				
NUCLEAR		4.13E+10	51.7%	2.72E+09
nuclear	0.066	4.13E+	51.7%	2.72E+09
TOTAL	0.181	8.23E+10		1.49E+10

Electricity EF (LCA based)

0.181 kg CO_2eq/kWh

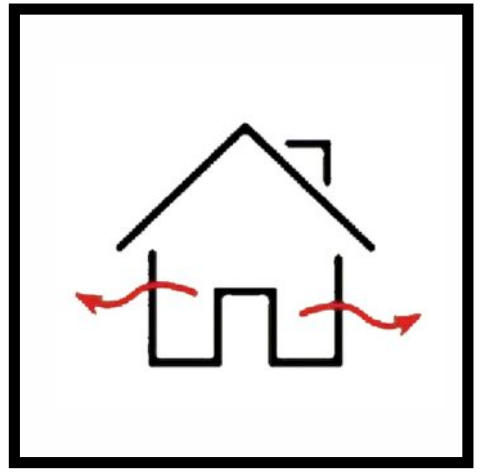
0.460 kg CO_2eq/kWh

CITY-zen
New urban energy

Carbon Accounting: Riccardo M. Pulselli, University of Siena

ROESELARE CITY (BELGIUM)
TYPICAL HOUSEHOLD PROFILING

ROESELARE		HOUSEHOLD PROFILE			
Emission sources	unit	rawdata	%	kg CO2-eq	%
ENERGY	**kWh**	**15840**	_	**3476**	**51.3%**
LIGHTING&APPLIANC.	**kWh**	**3563**	100%	643	9.5%
electricity	Kwh	3563	100%	643	9.5%
HEAT+DHW+cooking	**kWh**	**12277**	100%	2833	41.8%
Nat gas	kWh	10021	82%	2522	37.2%
LGP	kWh	460	4%	121	1.8%
Biomass	kWh	1662	14%	189	2.8%
Solar thermal	kWh	43	0.3%	0	0.0%
Geothermal	kWh	91	1%	0	0.0%
MOBILITY	**kWh**	**10858**	100%	**2972**	**43.8%**
Electric car	kW	2	0.0%	0	0.0%
LGP+Gas	kWh	28	0.3%	7	0.1%
Diesel	kWh	8945	82%	2550	37.6%
Gosoline	kWh	1554	14%	414	6.1%
Bio-fuel	kWh	328	3%	0	0.0%
WASTE	**kg**	**1076**	100%	**276**	**4.1%**
% waste-to-energy	kg	312	29%	204	3.0%
% organic	kg	230	21%	21	0.3%
% landfill	kg	44	4%	51	0.8%
% recycling	kg	490	46%	0	0.0%
WATER	**m^3**	**96**	100%	**56**	**0.8%**
m3 per yr (house)	m^3/	**96**	100%	56	0.8%
TOTAL				**6779**	**100%**



HOUSEHOLD profile

People: 2.34 inhab./house

Electricity: 3500 kWh/yr

Natural gas: 12300 kWh/yr

Mobility: 18000 km/yr

Waste: 467 kg/cap yr

Water: 114 L/cap day

ROESELARE IS 'R VOOR JOU

CITY-zen New urban energy

Carbon Accounting: Riccardo M. Pulselli, University of Siena

ROESELARE CITY (BELGIUM)
TYPICAL HOUSEHOLD PROFILING

HOUSEHOLD IN ROESELARE

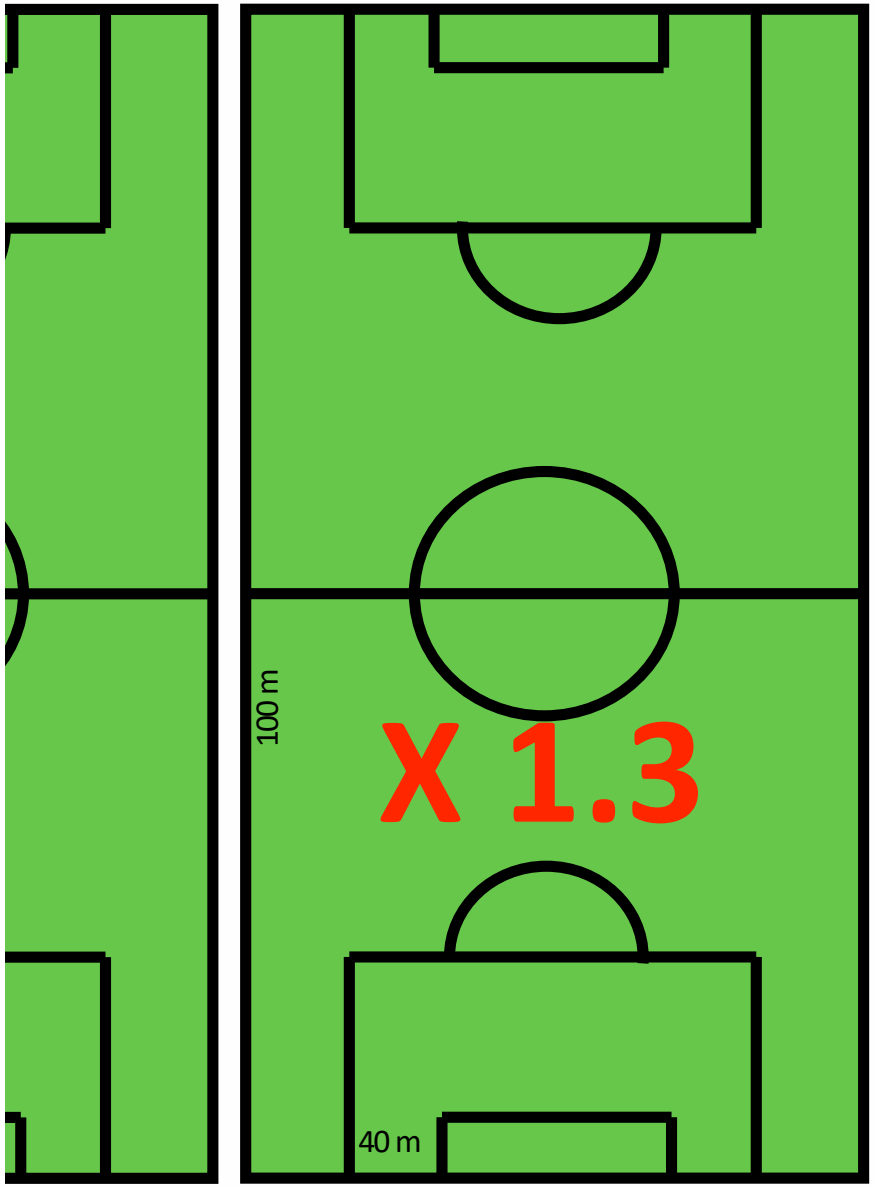
ROESELARE
IS 'R VOOR JOU

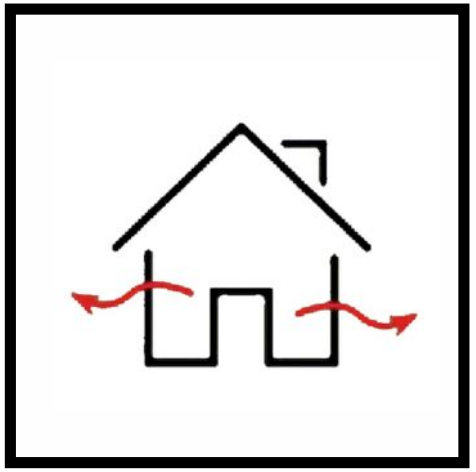
CARBON FOOTPRINT

6.78 t CO_2eq/yr

7.72 t CO_2eq/yr

Carbon Footprint Offset per household
0.50 ha forestland





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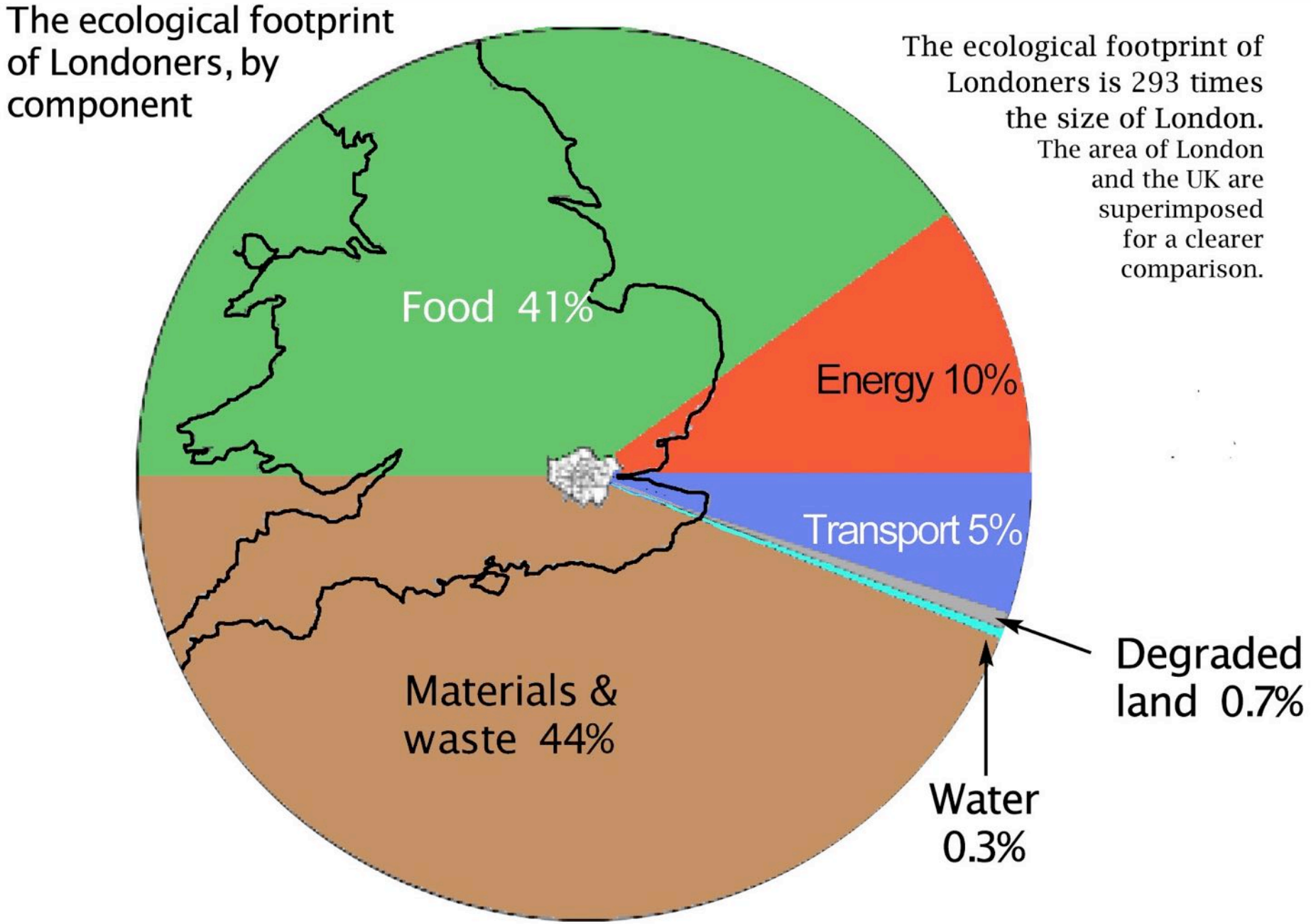
CITY-zen
New urban energy

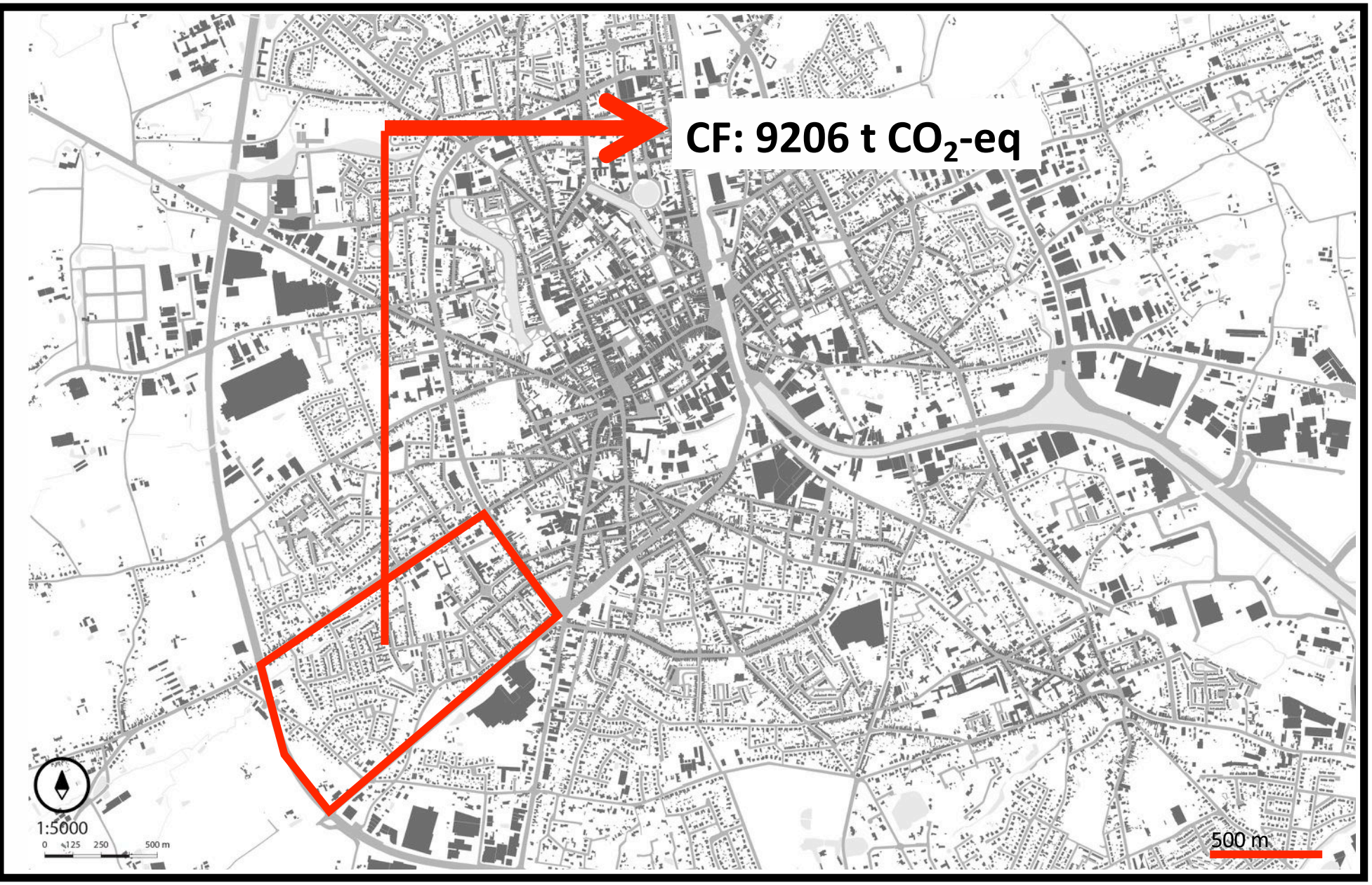
Carbon Accounting: Riccardo M. Pulselli, University of Siena

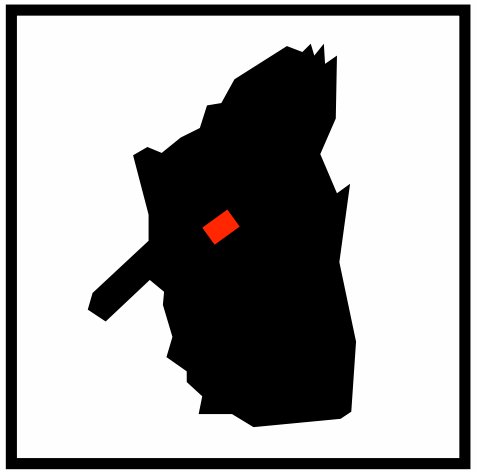
Roeselare, Belgium. April 2018

….Around 293……..


The ecological footprint of Londoners, by component
The ecological footprint of Londoners is 293 times the size of London.
The area of London and the UK are superimposed for a clearer comparison.
Food 41%
Energy 10%
Transport 5%
Degraded land 0.7%
Water 0.3%
Materials & waste 44%

COLLIEVIJVER NEIGHBOURHOOD





COLLIEVIJVER NEIGHBOURHOOD

1358 households

2795 inhabitants

77 ha area

36 inhab./ha

CITY-zen
New urban energy

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

COLLIEVIJVER NEIGHBOURHOOD

X 8.9

CF: 9206 t CO_2-eq

= 682 ha forestland

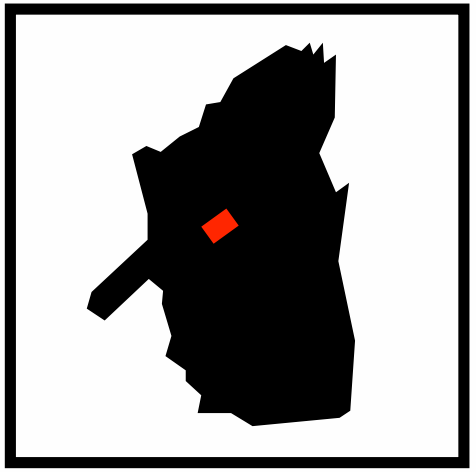
2.7 km

10 ha square

2.4 km

1:5000

0 125 250 500 m



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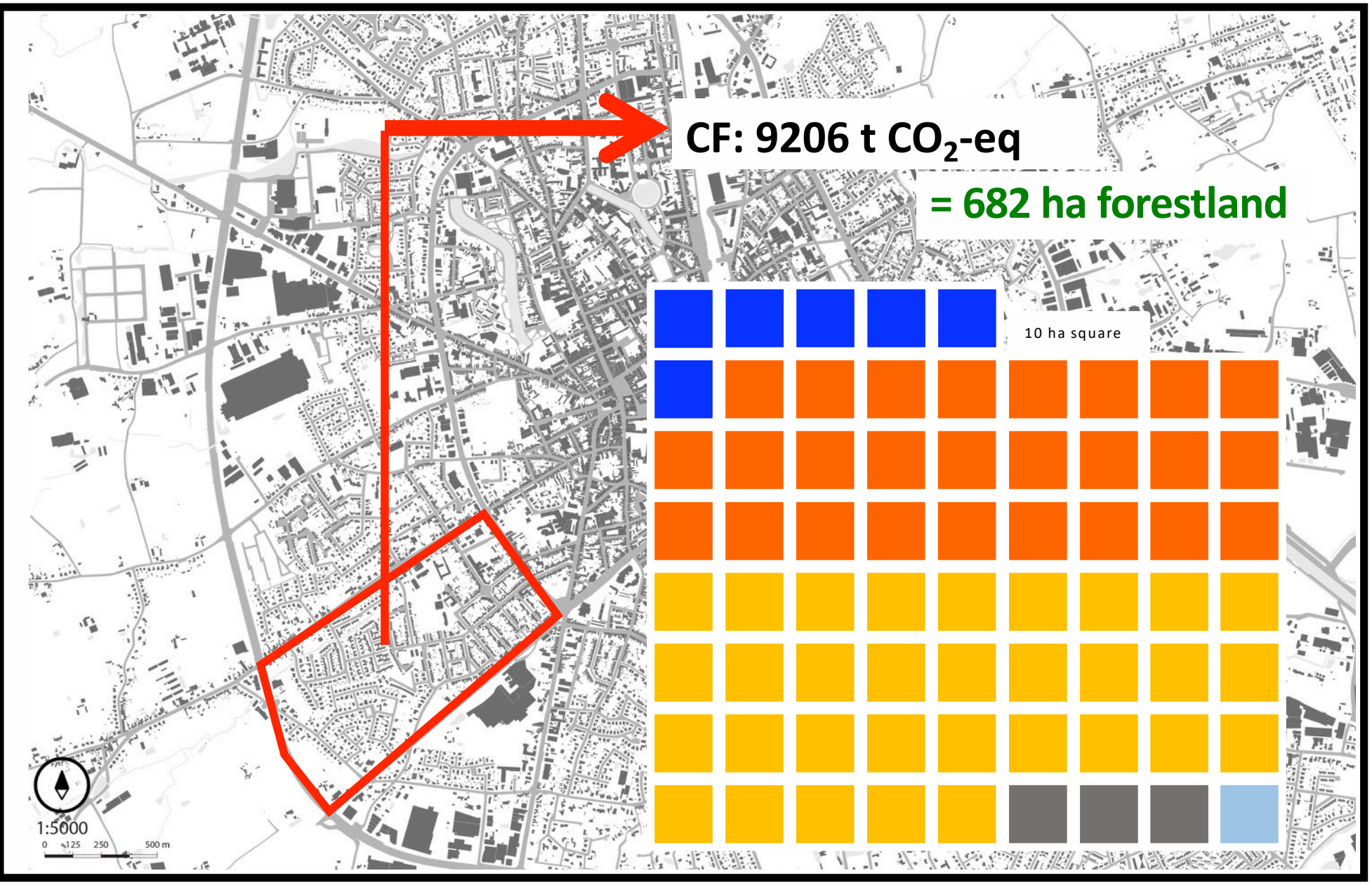
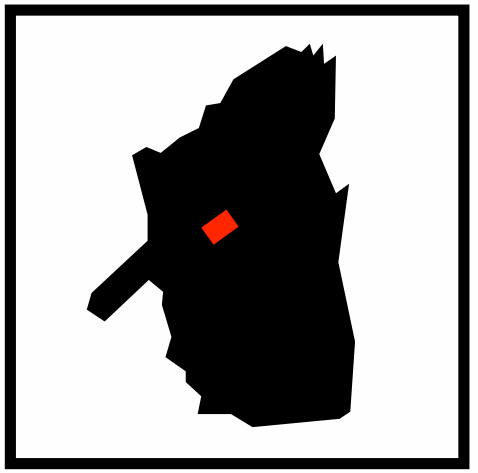




COLLIEVIJVER NEIGHBOURHOOD

- ELECTRICITY
- NATURAL GAS
- MOBILITY
- WASTE

CITY-zen
New urban energy

Carbon Accounting: Riccardo M. Pulselli, University of Siena

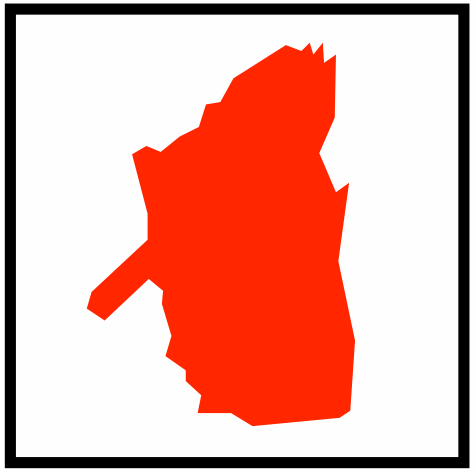
Roeselare, Belgium. April 2018

CARBON FOOTPRINT OF ROESELARE CITY

ROESELARE		MUNICIPALITY			
Emission sources	unit	rawdata	%	t CO2-eq	%
ENERGY	**MWh**	**415222**	_	**91,118**	**22.1%**
LIGHTING&APPLIANC.	**MWh**	**93402**	100%	16,867	4.1%
electricity	MWh	93402	100%	16,867	4.1%
HEAT+DHW+cooking	**MWh**	**321820**	100%	74,251	18.0%
Nat gas	MWh	262681	82%	66,115	16.0%
LGP	MWh	12071	4%	3,171	0.8%
Biomass	MWh	43560	14%	4,965	1.2%
Solar thermal	MWh	1124	0%	0	0.0%
Geothermal	MWh	2383	1%	0	0.0%
MOBILITY	**MWh**	**284617**	100%	**77,894**	**18.9%**
Electric car	MWh	63	0.0%	11	0.0%
LGP+Gas	MWh	731	0.3%	192	0.0%
Diesel	MWh	234482	82.4%	66,836	16.2%
Gosoline	MWh	40733	14.3%	10,855	2.6%
Bio-fuel	MWh	8608	3.0%	0	0.0%
WASTE	**t**	**28345**	100%	**7,260**	**1.8%**
% waste-to-energy	t	8231	29%	5,367	1.3%
% organic	t	6049	21%	548	0.1%
% landfill	t	1159	4%	1,345	0.3%
% recycling	t	12919	46%	0	0.0%
WATER	**m^3**	**2521692**	100%	**1,476**	**0.4%**
m3 per yr (house)	m^3/ yr	**2521692**	100%	1,476	0.4%
RESIDENTIAL				**177,748**	**43%**
TERTIARY (private + public)	MWh	442647	_	99,898	24.2%
AGRICULTURE	MWh	28392	_	7,666	1.9%
INDUSTRY	MWh	639487	_	124,644	30.2%
public transport	MWh	5270	_	1,439	0.3%
public lighting	MWh	5546	_	1,002	0.2%
TOTAL				**412,396**	**100%**

CARBON FOOTPRINT

412 kt CO_2eq/yr



Roeselare City

61,657 inhabitants

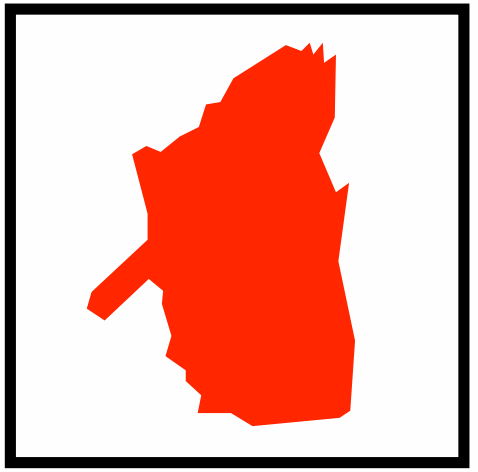
26,349 households

5979 ha area

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

CARBON FOOTPRINT OF ROESELARE CITY



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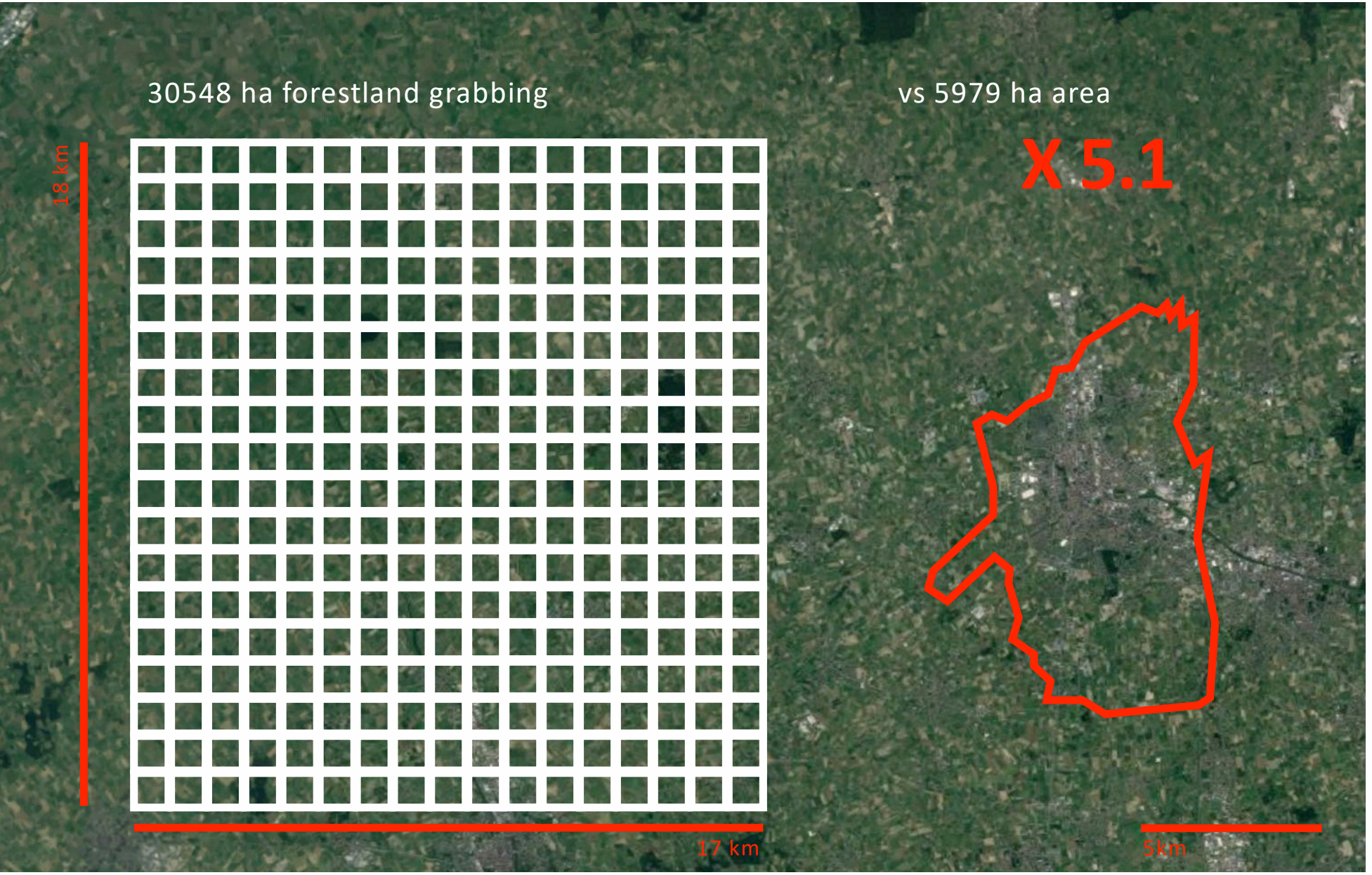


Roeselare City

CARBON FOOTPRINT

412,000 t CO2 eq

FORESTLAND GRABBING

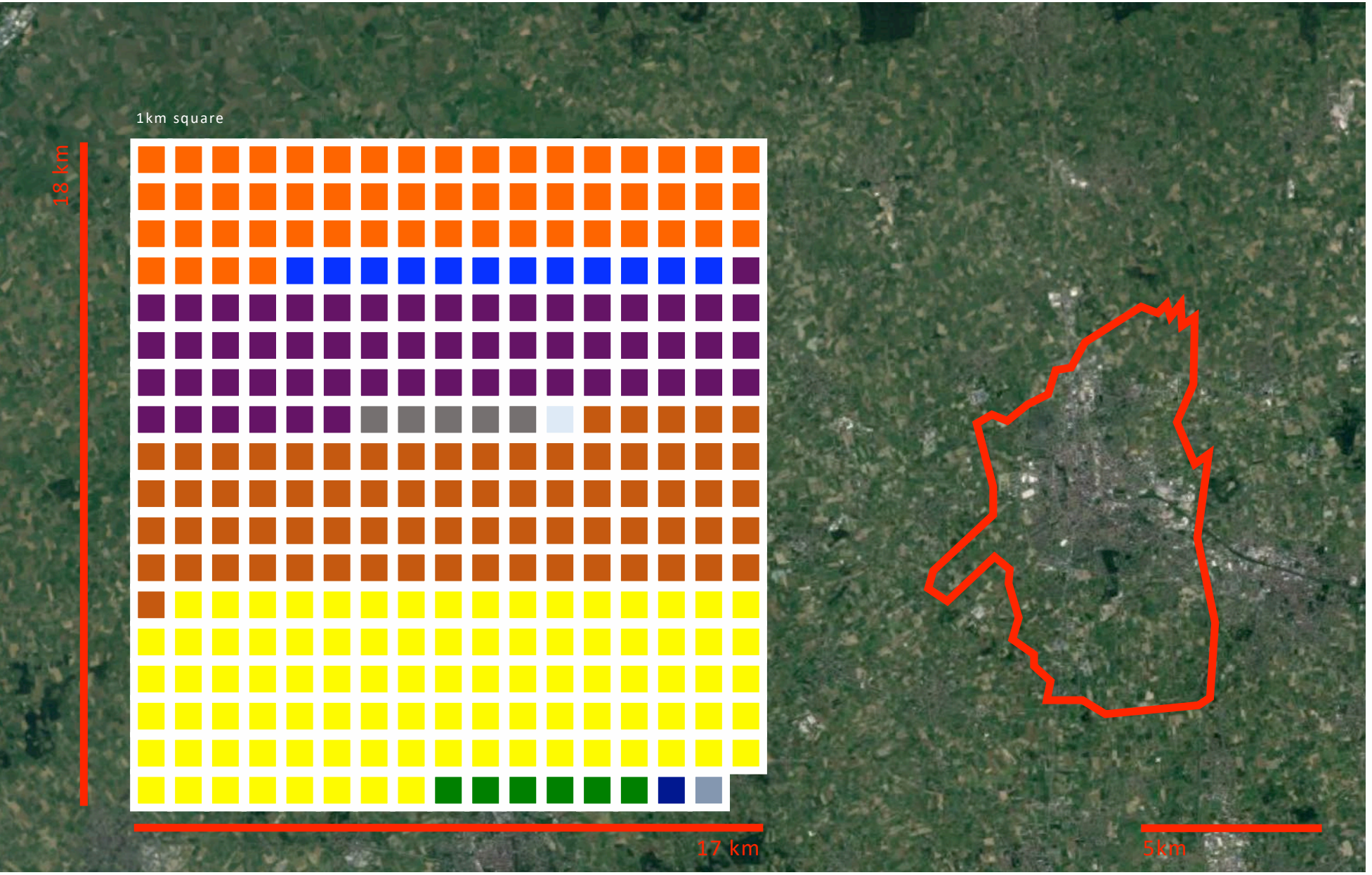
30,548 ha

CITY-zen
New urban energy

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

CARBON FOOTPRINT OF ROESELARE CITY



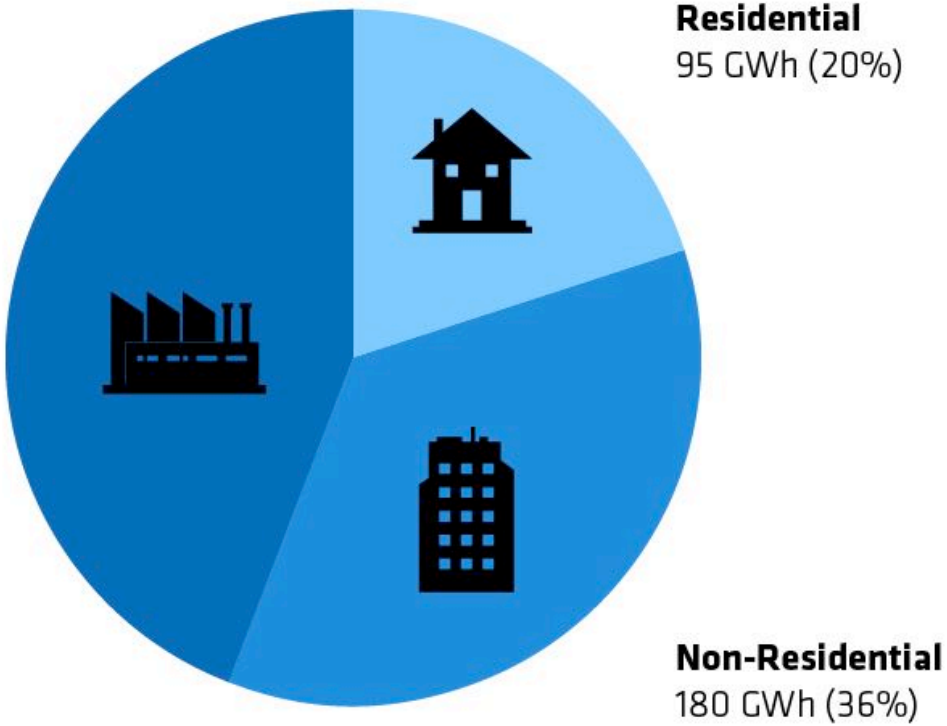
- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- WASTE (URBAN)
- WATER USE (HOUSING)
- TERTIARY
- INDUSTRY
- AGRICULTURE
- Public transport
- Public lighting

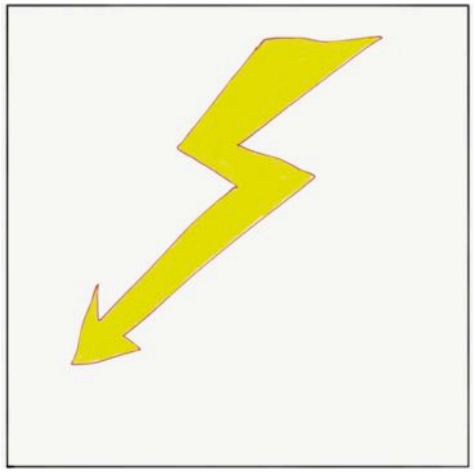
CITY-zen
New urban energy

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

Electricity demand Roeselare 2015 (GWh)





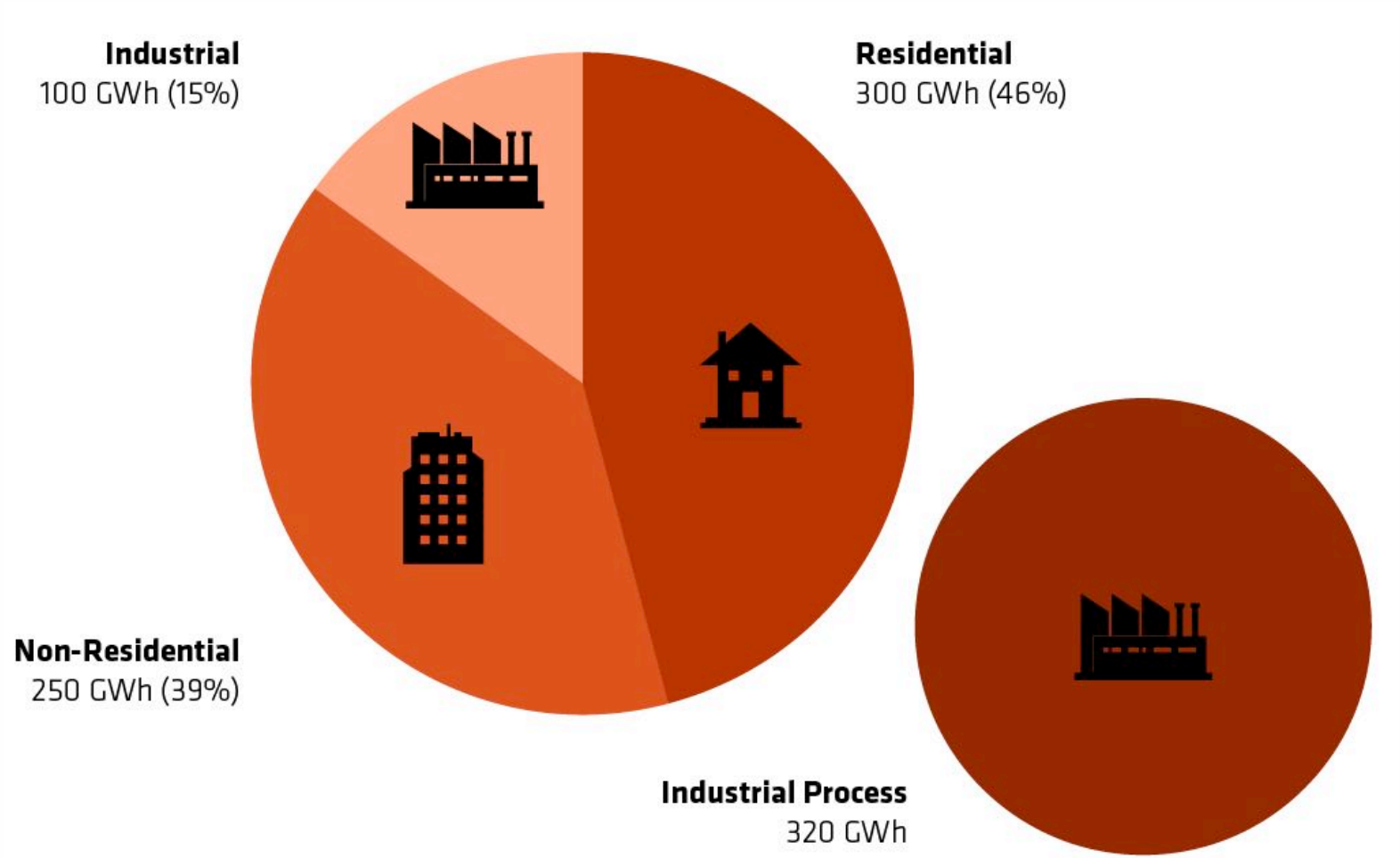
Current Electricity Demand

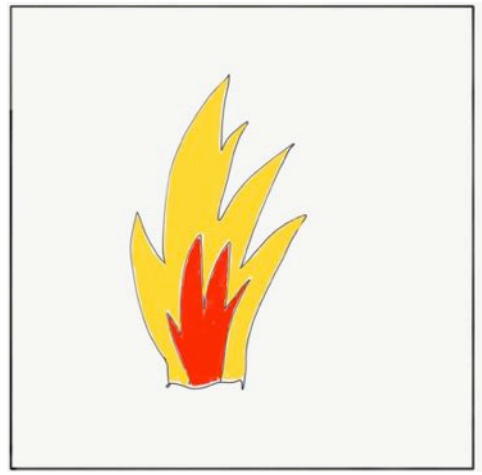
495 GWh-e in 2015

Energy strategy: Siebe Broersma MSc, Technical University, Delft.

Roeselare, Belgium. April 2018

Heat demand Roeselare 2015 (GWh)





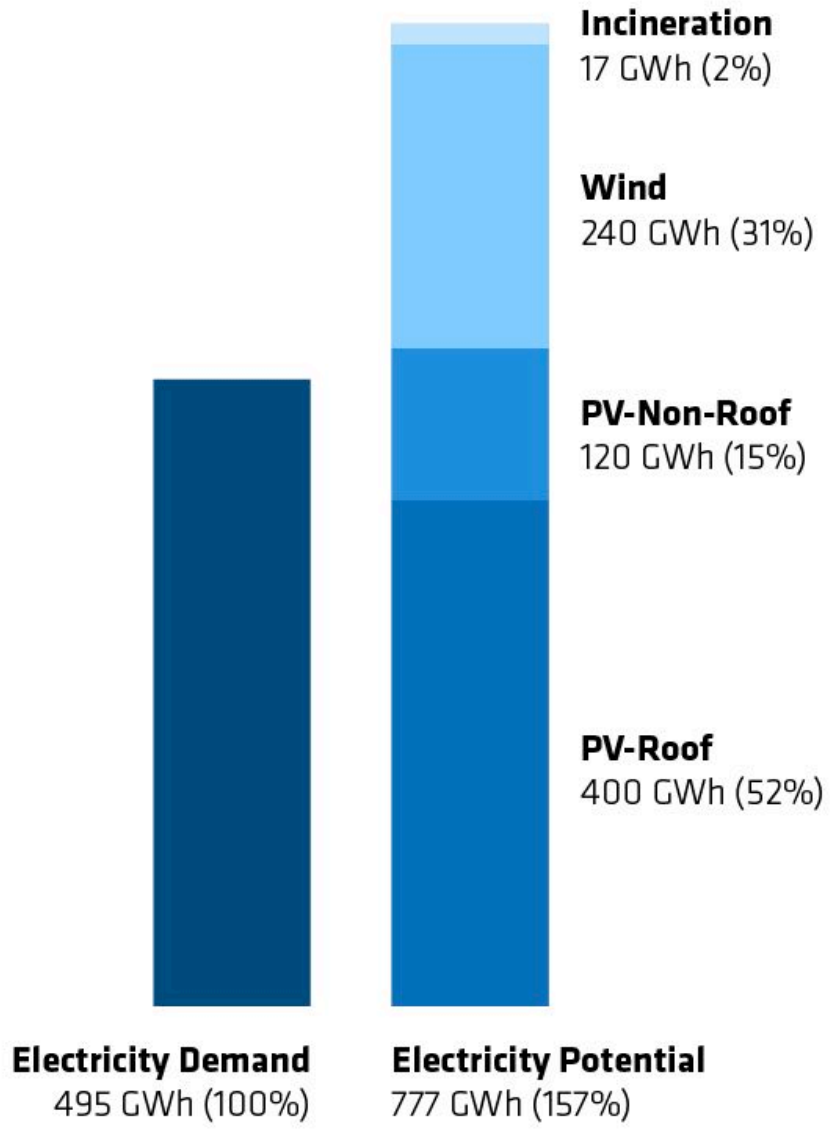
Current Heat Demand

620 GWh-th in 2015
+
320 GWh-pr

Energy strategy: Siebe Broersma MSc, Technical University, Delft.

Roeselare, Belgium. April 2018

Electricity potentials in Roeselare



Space for production

40 Wind turbines

50% of all roofs (235 ha)

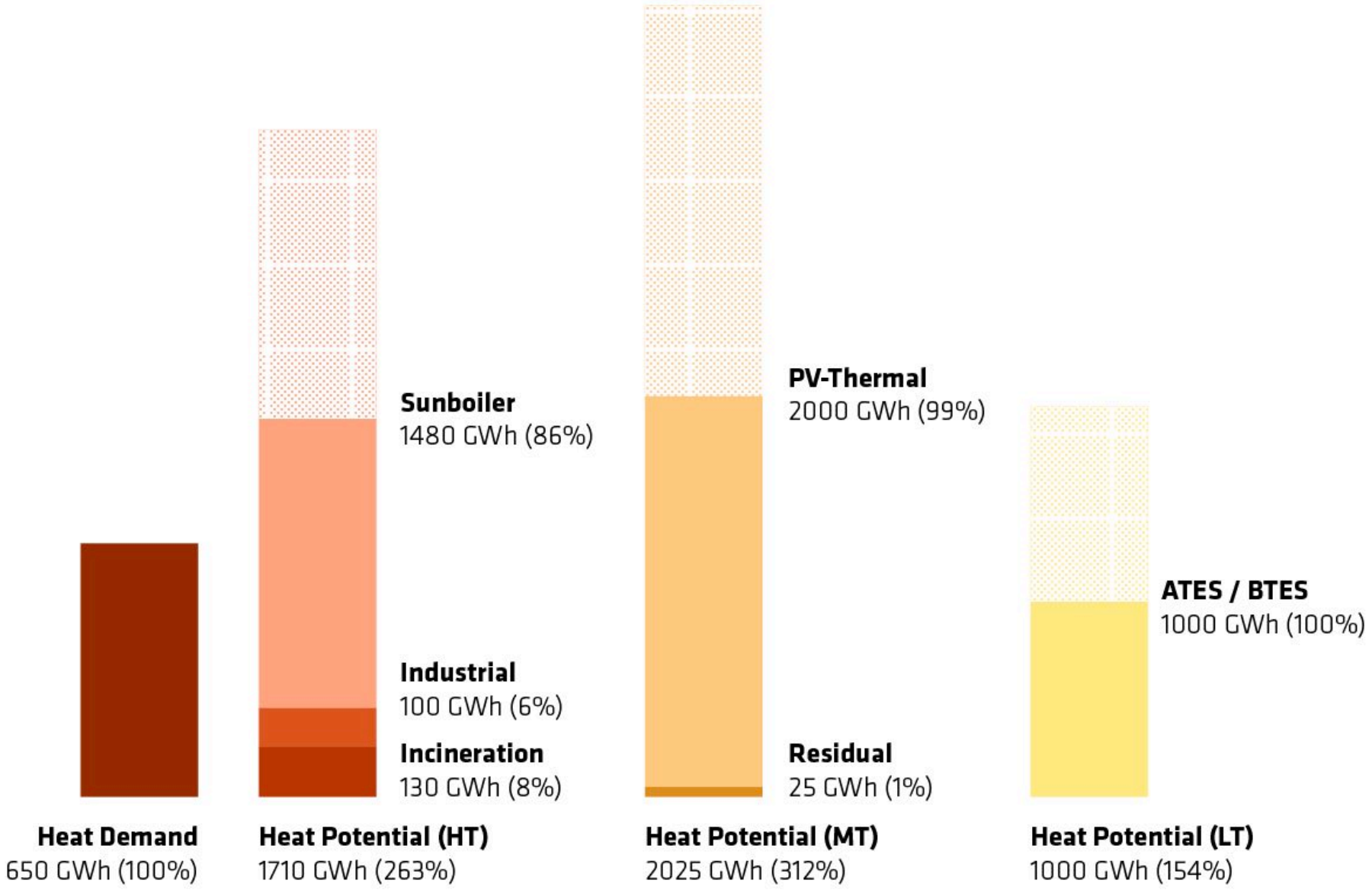
80 ha non-roof

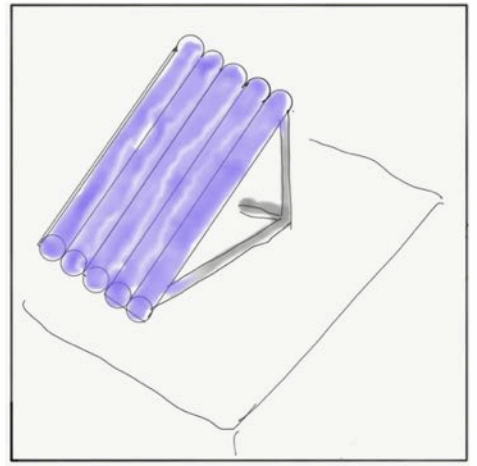
CITY-zen
New urban energy

Energy strategy: Siebe Broersma MSc, Technical University, Delft.

Roeselare, Belgium. April 2018

Heat potentials in Roeselare





Temperature levels

High-T for district heat network (DHN)

Mid-T needs energy renovation

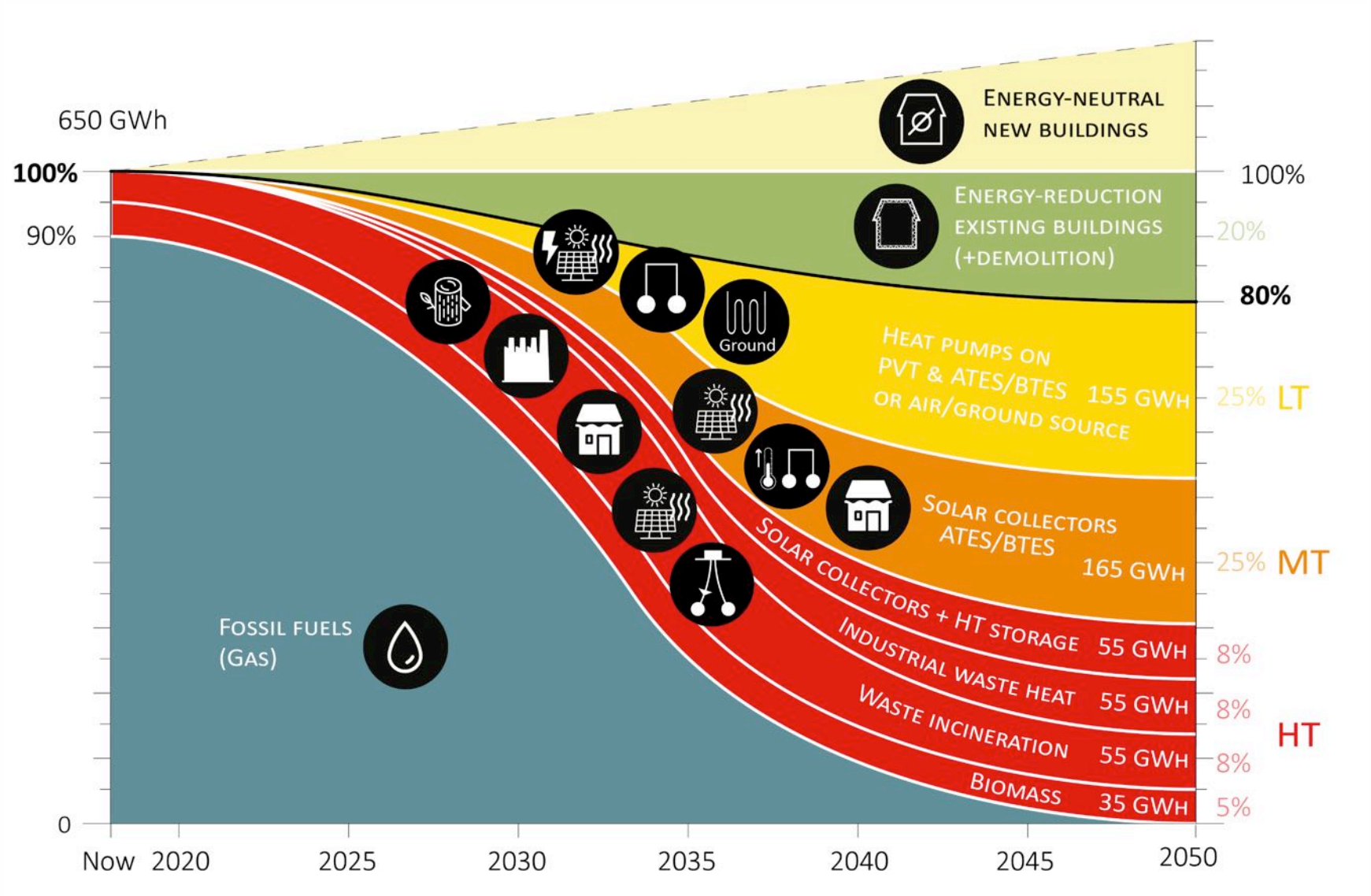
Low-T needs heat pumps and energy renovation

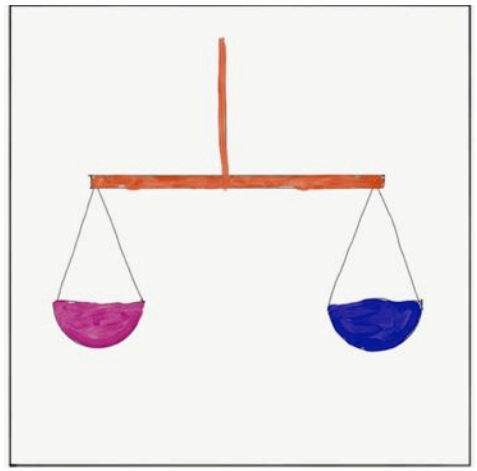
CITY-zen
New urban energy

Energy strategy: Siebe Broersma MSc, Technical University, Delft.

Roeselare, Belgium. April 2018

Heat Balance towards 2050





Temperature levels

30% High-T for DHN

25% Mid-T

25% Low-T

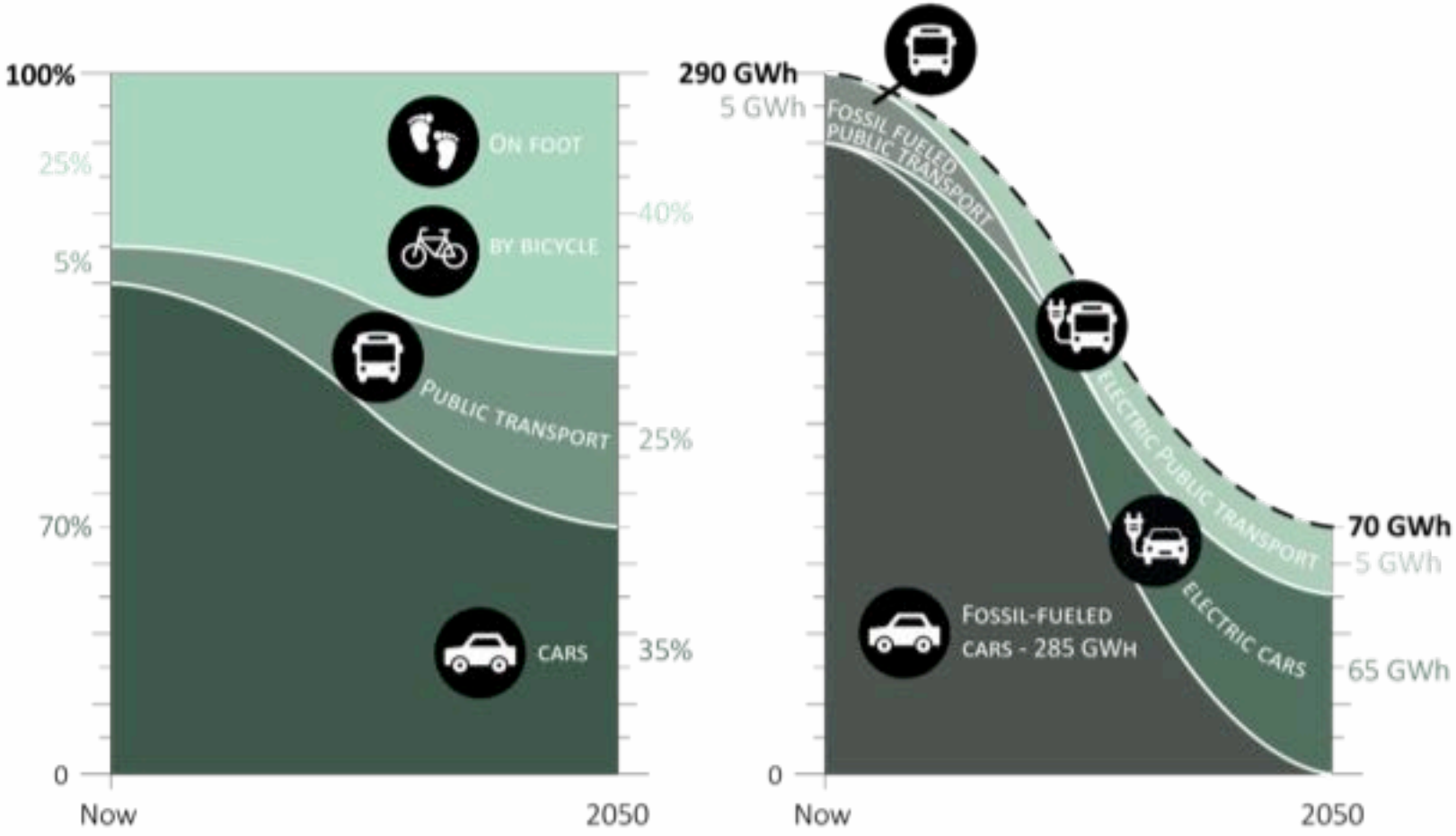
20% reduction

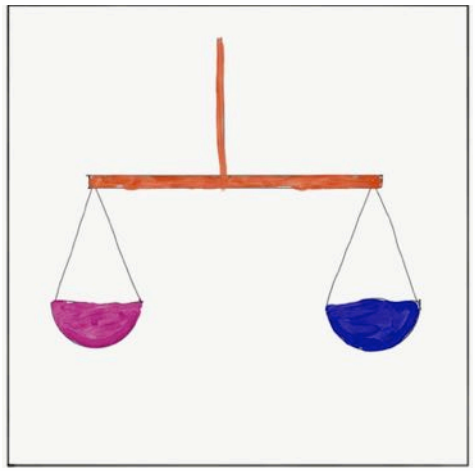
CITY-zen
New urban energy

Energy strategy: Siebe Broersma MSc, Technical University, Delft.

Roeselare, Belgium. April 2018

Sustainable transport scenario





Main directions

Modal shift

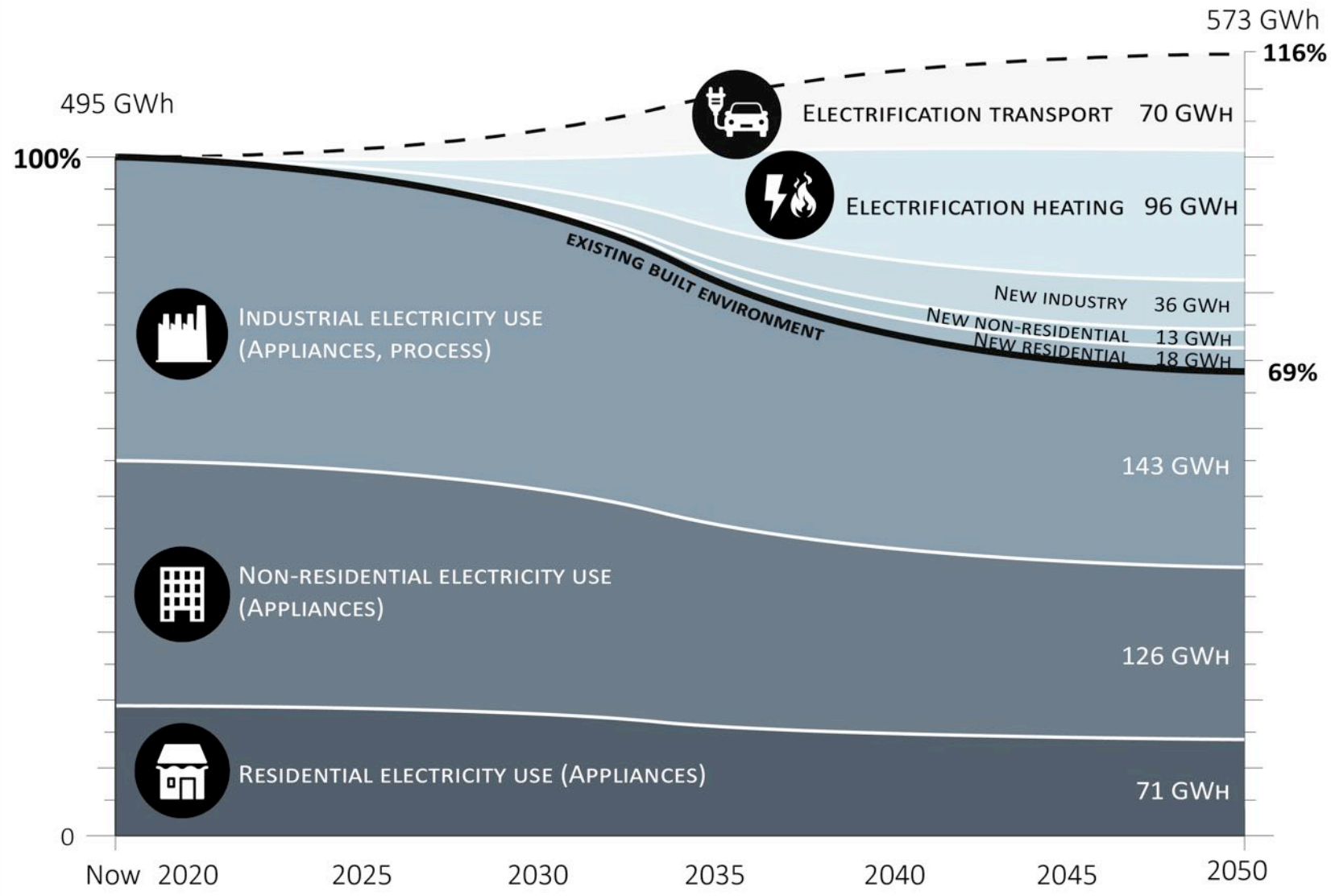
Electrification

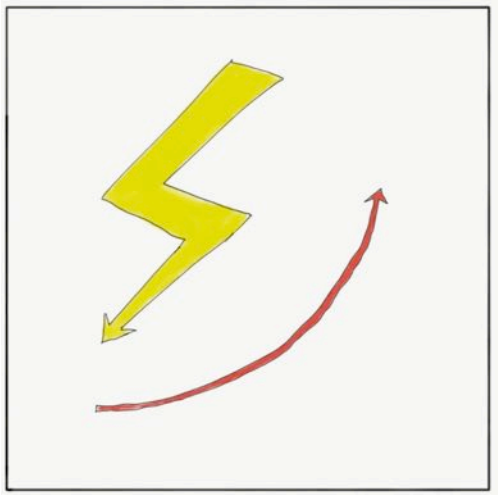
CITY-zen
New urban energy

Energy strategy: Siebe Broersma MSc, Technical University, Delft.

Roeselare, Belgium. April 2018

Electricity demand scenario towards 2050





Assumptions

30% reduction of current demand for appliances

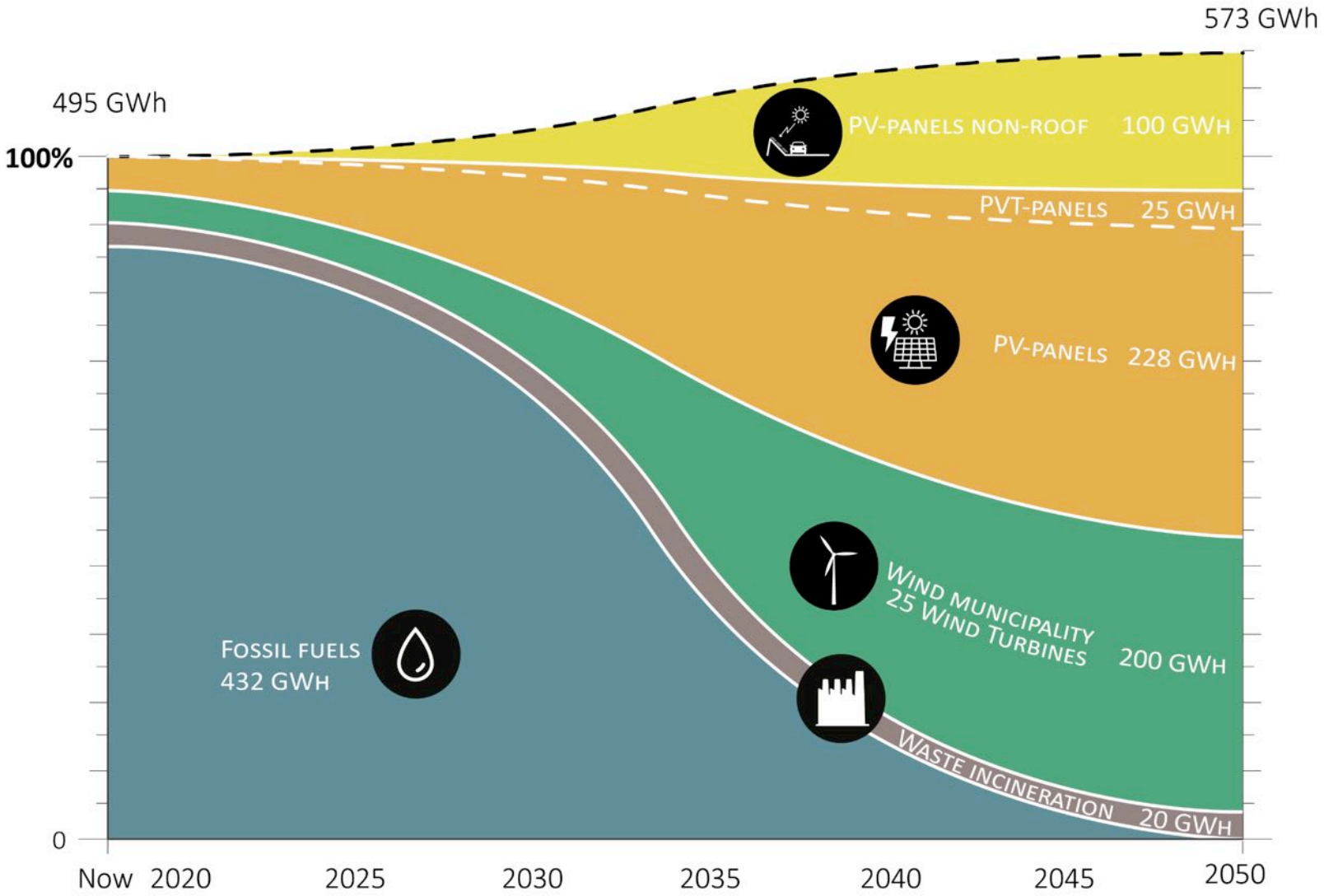
15% total increase due to Electrification of

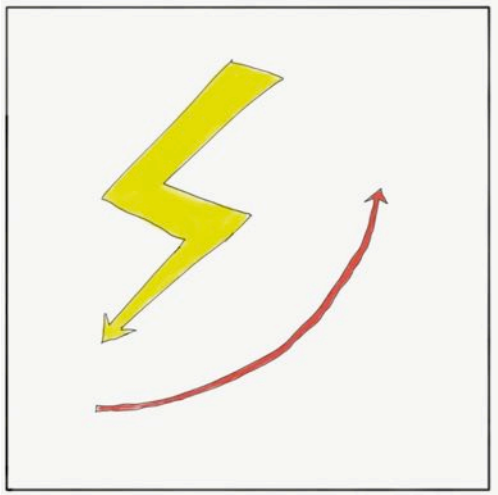
Heating + transport

Energy strategy: Siebe Broersma MSc, Technical University, Delft.

Roeselare, Belgium. April 2018

Electricity Balance towards 2050





Main measures

25 Wind Turbines

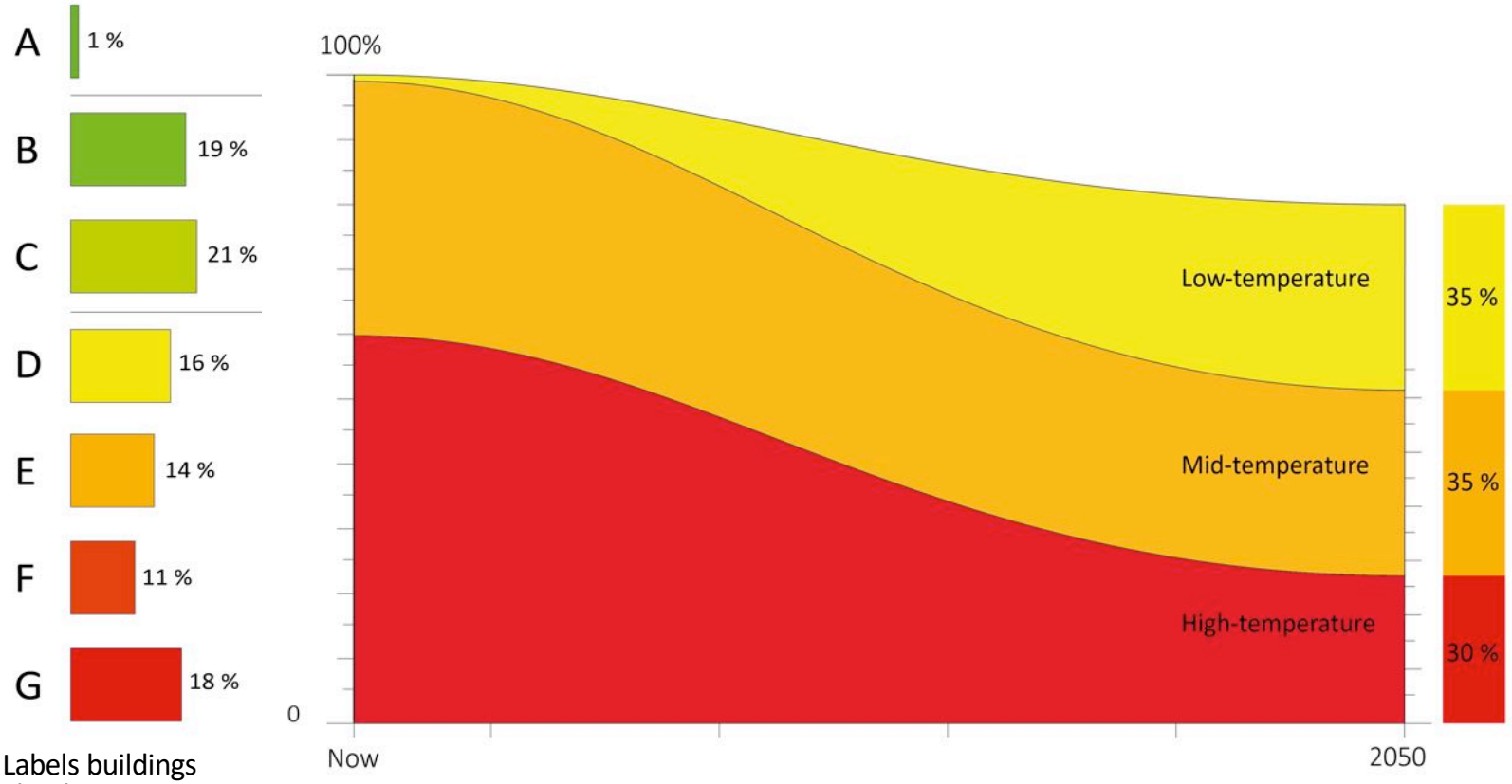
240 ha PV panels

Co-generation of waste incineration

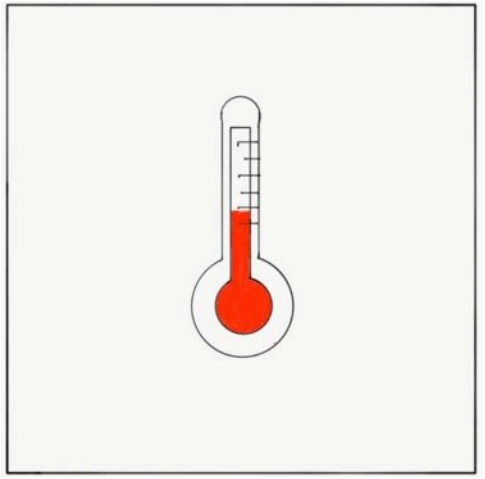
Energy strategy: Siebe Broersma MSc, Technical University, Delft.

Roeselare, Belgium. April 2018

Temperature levels for heating of buildings towards 2050



Labels buildings Flanders



Required temperatures

HT = > 65°C

MT = 40°C - 65°C

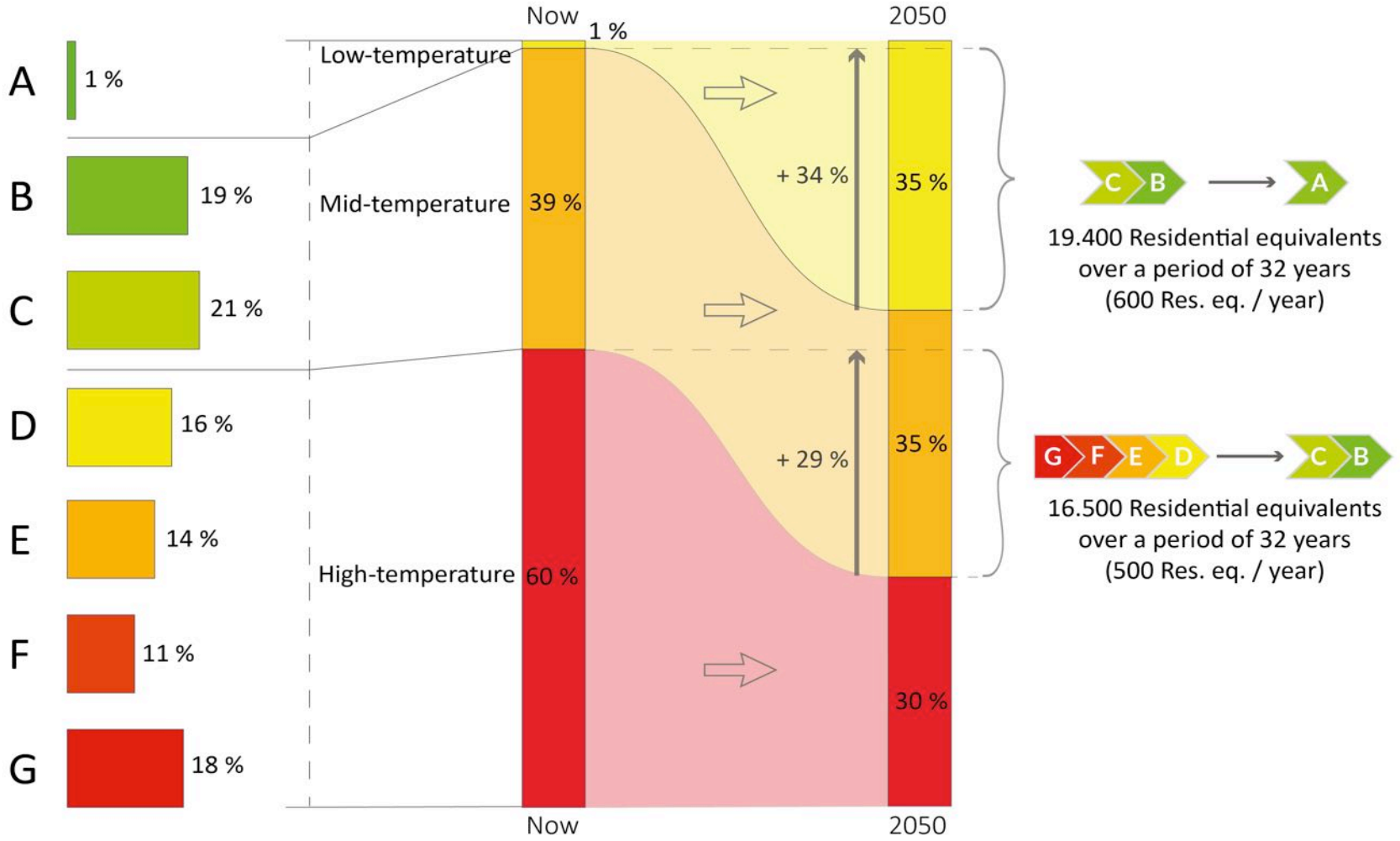
LT = < 45°C

CITY-zen
New urban energy

Energy strategy: Siebe Broersma MSc, Technical University, Delft.

Roeselare, Belgium. April 2018

Required energy renovations of building stock towards 2050

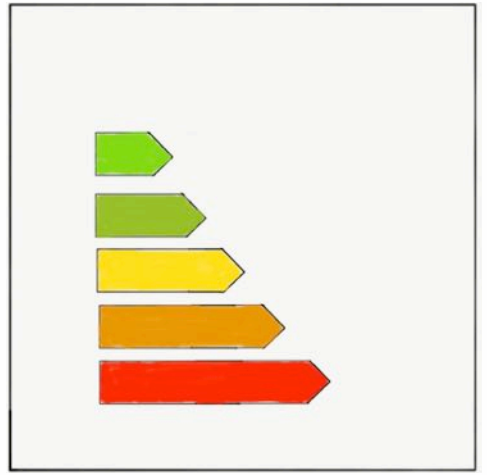


C B → A

19.400 Residential equivalents over a period of 32 years (600 Res. eq. / year)

G F E D → C B

16.500 Residential equivalents over a period of 32 years (500 Res. eq. / year)



Building stock

57000 residential unit equivalents of which:

26000 residential

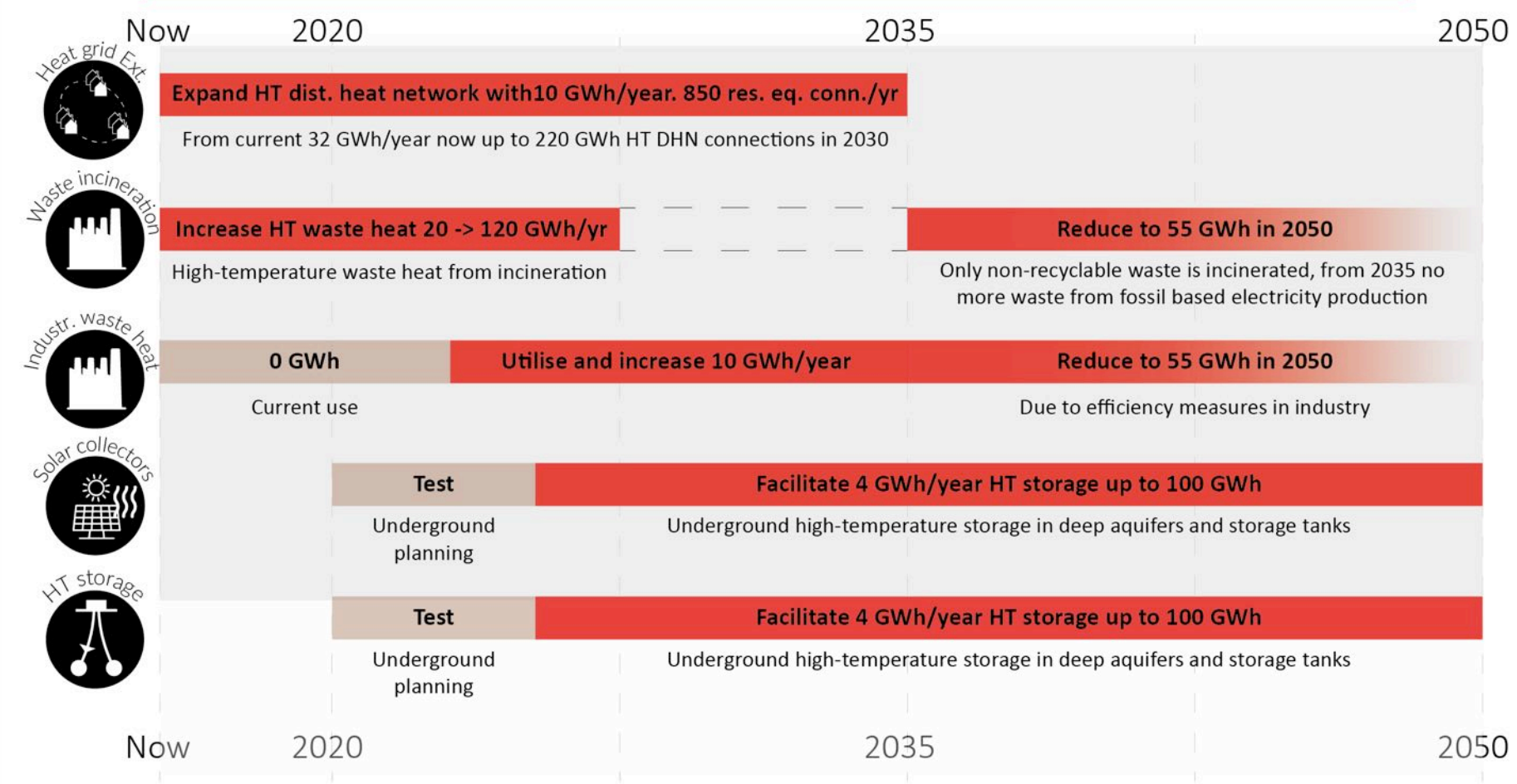
31000 non-residential

CITY-zen
New urban energy

Energy strategy: Siebe Broersma MSc, Technical University, Delft.

Roeselare, Belgium. April 2018

Roadmap for sustainable heating (HT) of Roeselare's current building stock



Main measures

DHN extension

Maximize waste heat use of industrial waste by 2035

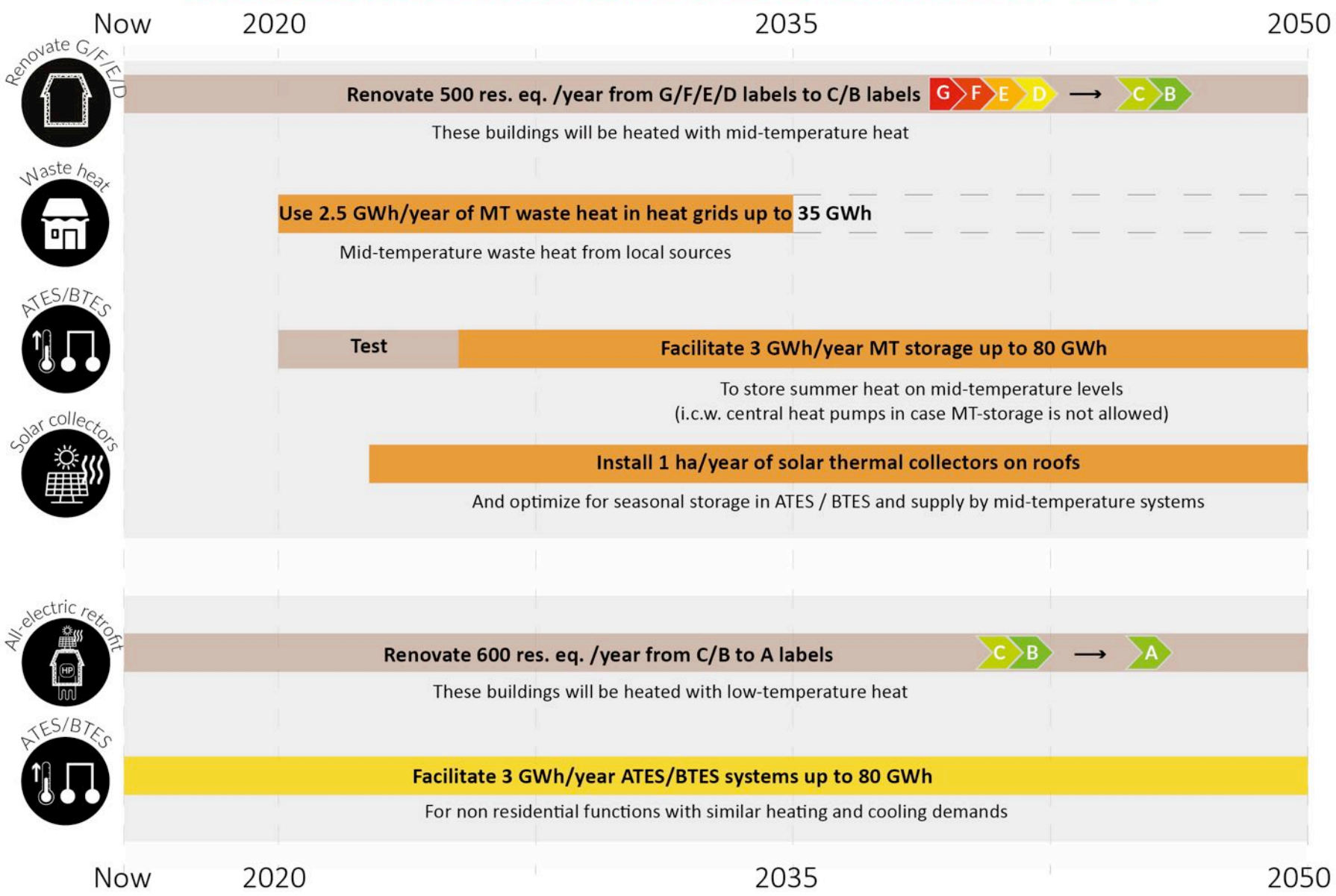
Partly reduced and replaced by solar heat and underground storage towards 2050

CITY-zen
New urban energy

Energy strategy: Siebe Broersma MSc, Technical University, Delft.

Roeselare, Belgium. April 2018

Roadmap for sustainable heating (MT + LT) of Roeselare's current building stock



Main measures

60% of building stock moderately renovated by 2050

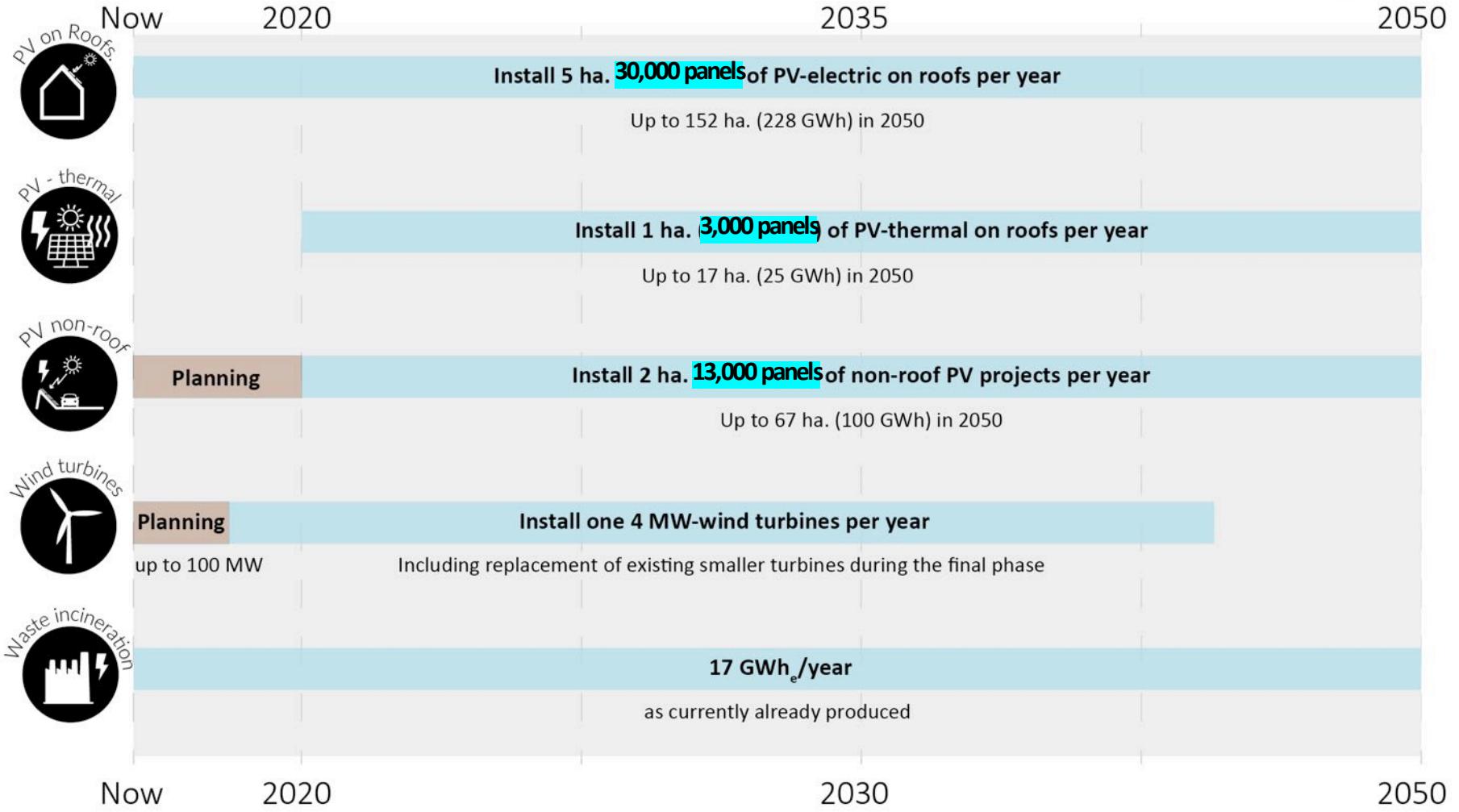
Solar collectors and MT-storage in underground

CITY-zen
New urban energy

Energy strategy: Siebe Broersma MSc, Technical University, Delft.

Roeselare, Belgium. April 2018

Roadmap for sustainable electricity production in Roeselare



Main measures

235 ha PV panels

25 4MW Wind Turbines

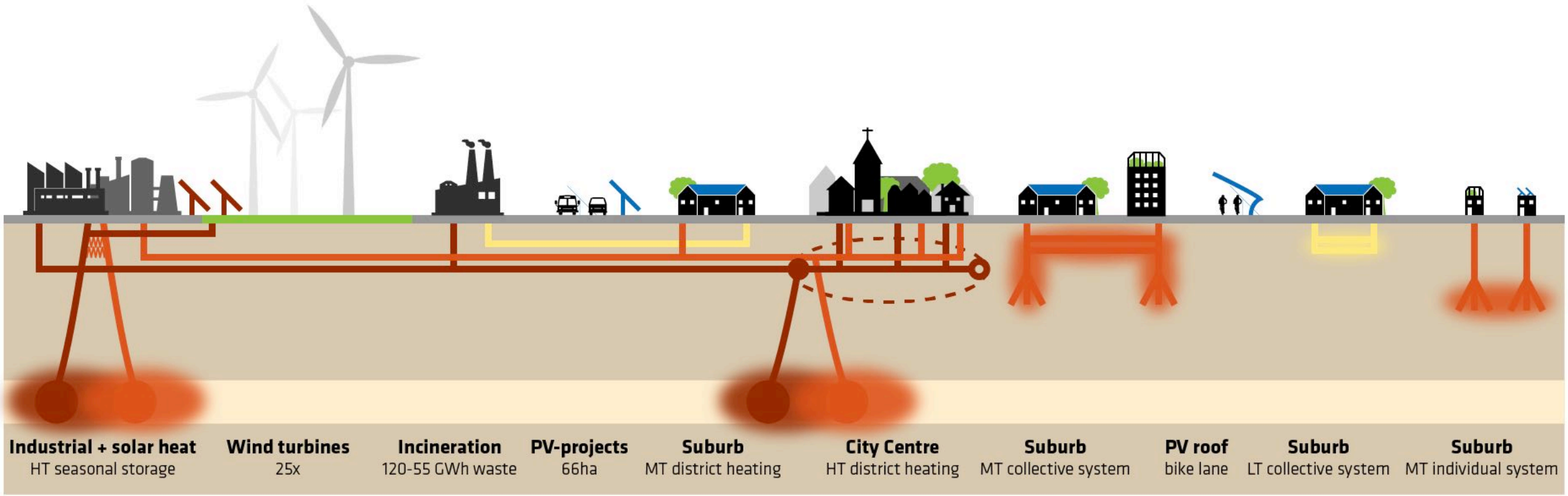
17 GWh-e from Waste Incineration

CITY-zen
New urban energy

Energy strategy: Siebe Broersma MSc, Technical University, Delft.

Roeselare, Belgium. April 2018

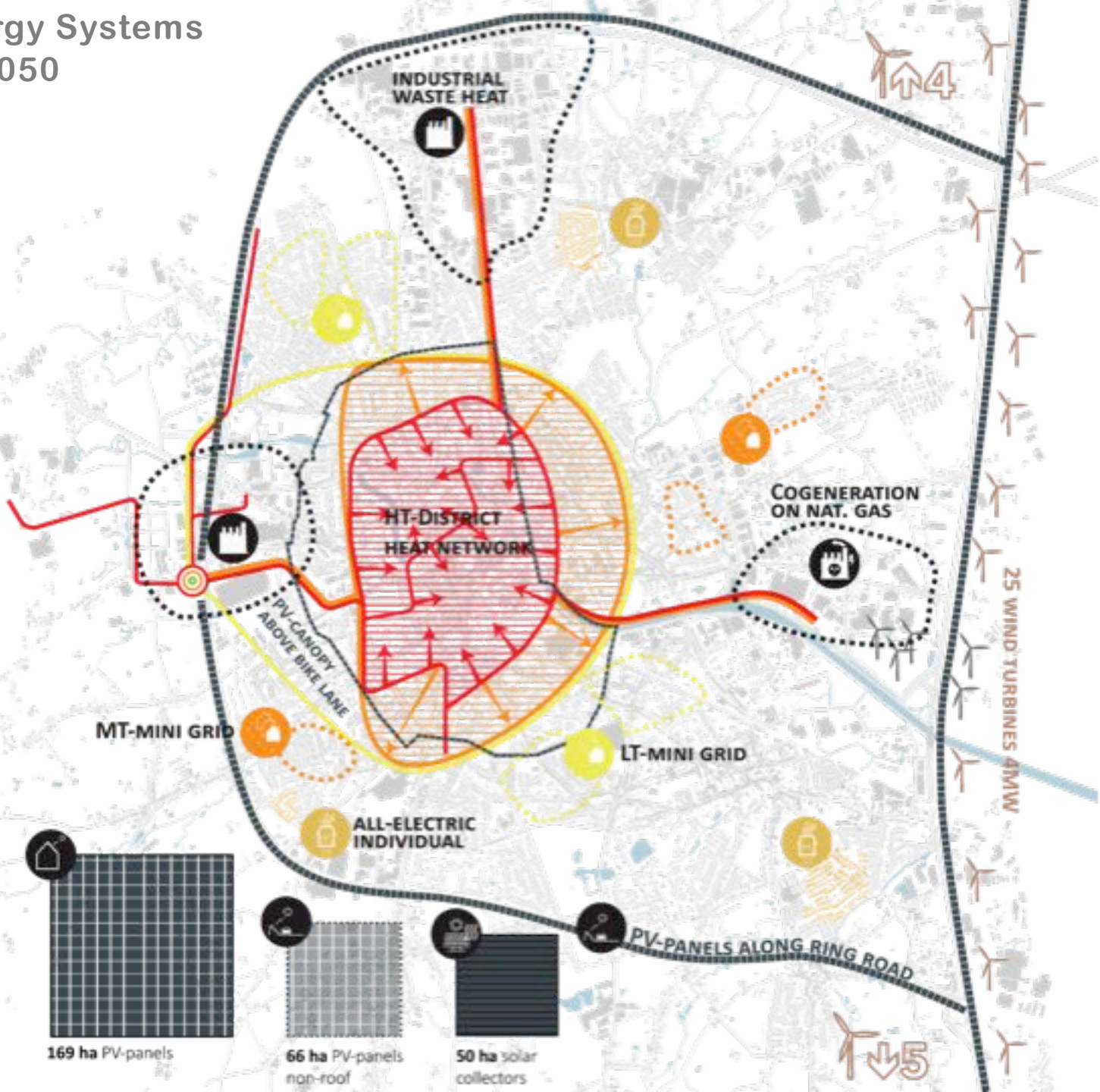
Schematic section of Roeselare's sustainable energy systems in 2050

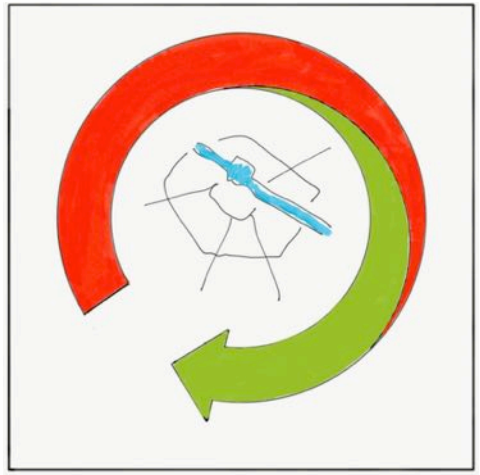


Energy strategy: Siebe Broersma MSc, Technical University, Delft.

Roeselare, Belgium. April 2018

Sustainable Energy Systems in Roeselare in 2050





Main directions

Central HT-DHN
Cascaded to

235 ha PV panels

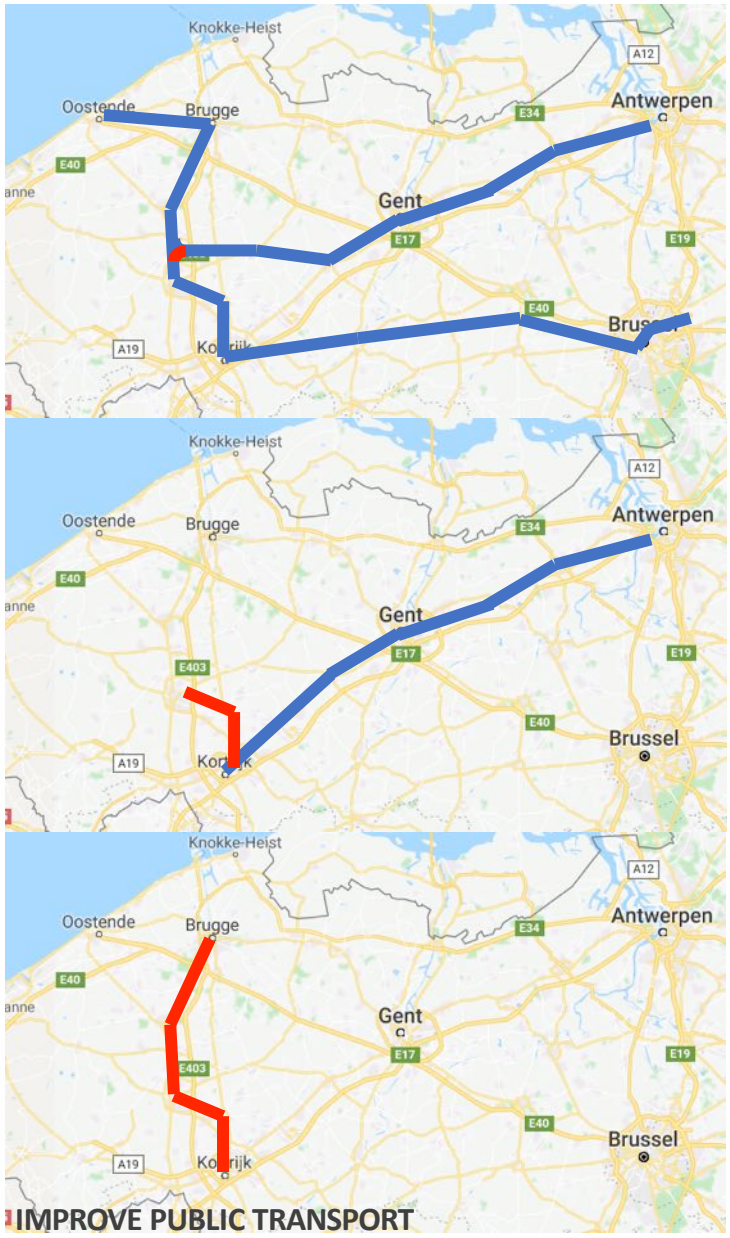
25 4MW Wind Turbines

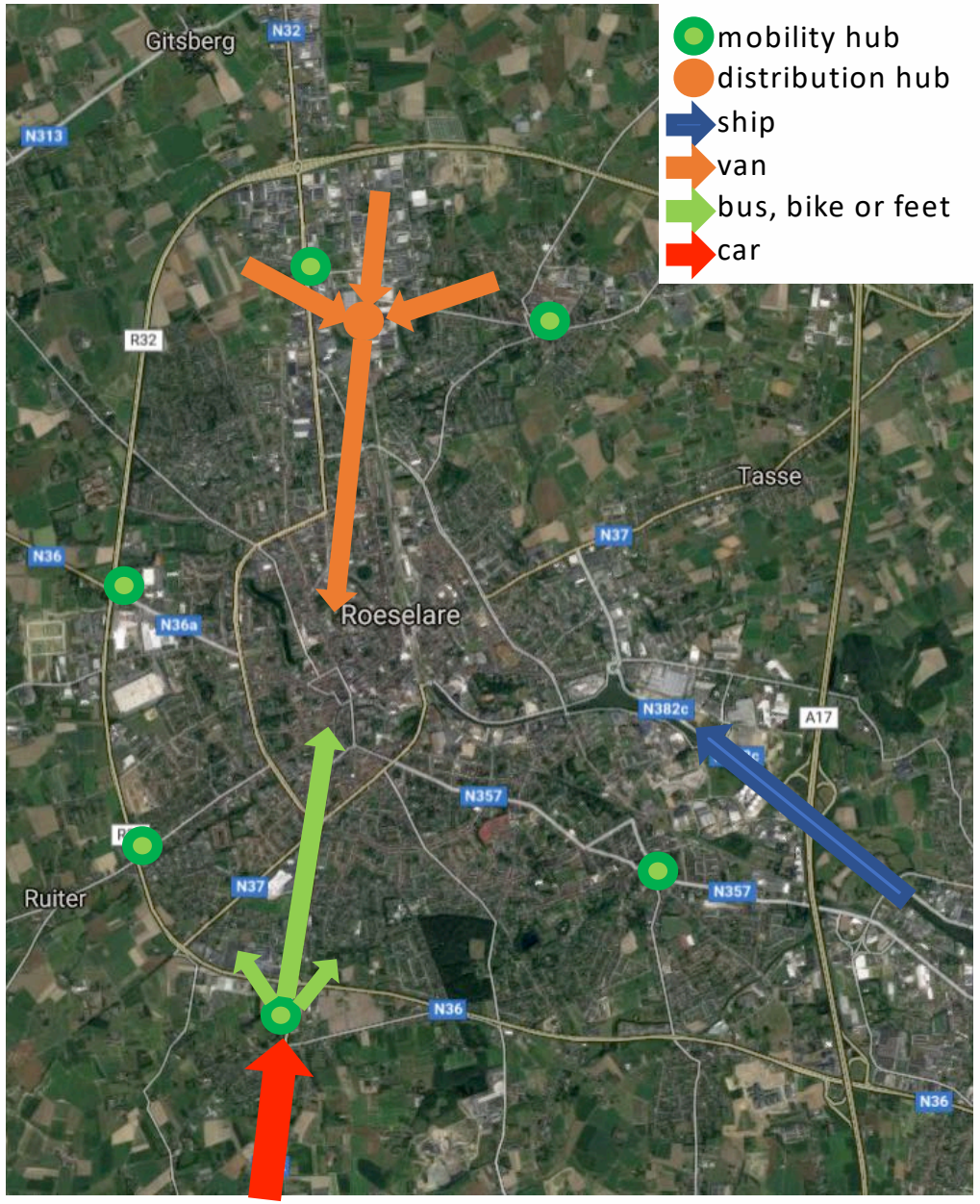
17 GWh-e from Waste Incineration

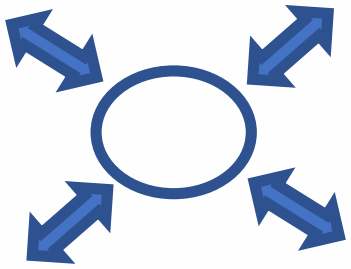
CITY-zen
New urban energy

Roeselare, Belgium. April 2018

Sustainable transport and mobility







Regional connectivity

People

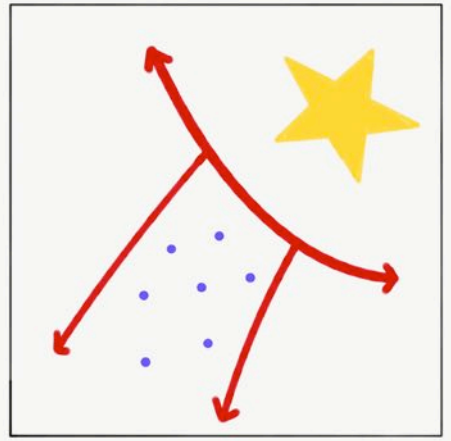
Packages

Heavy materials

Energy strategy: Siebe Broersma MSc, Technical University, Delft.

Roeselare, Belgium. April 2018

Urban Analysis



Urban disconnection

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

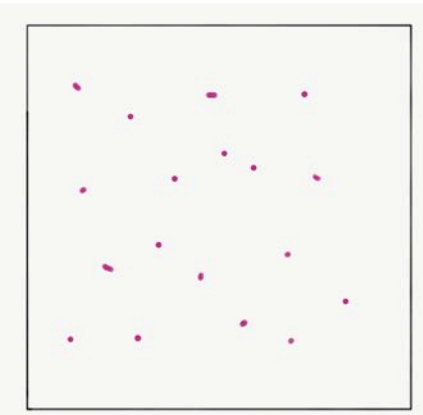
Urban Analysis

Neighbourhood disconnection

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

Urban Analysis



Low Density

1300 Houses

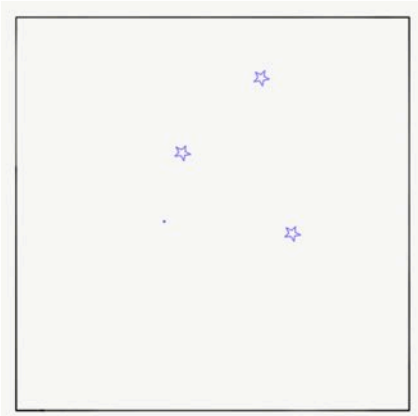
85 Hectares

15 Homes/Ha

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

Urban Analysis



Low Intensity

No bars

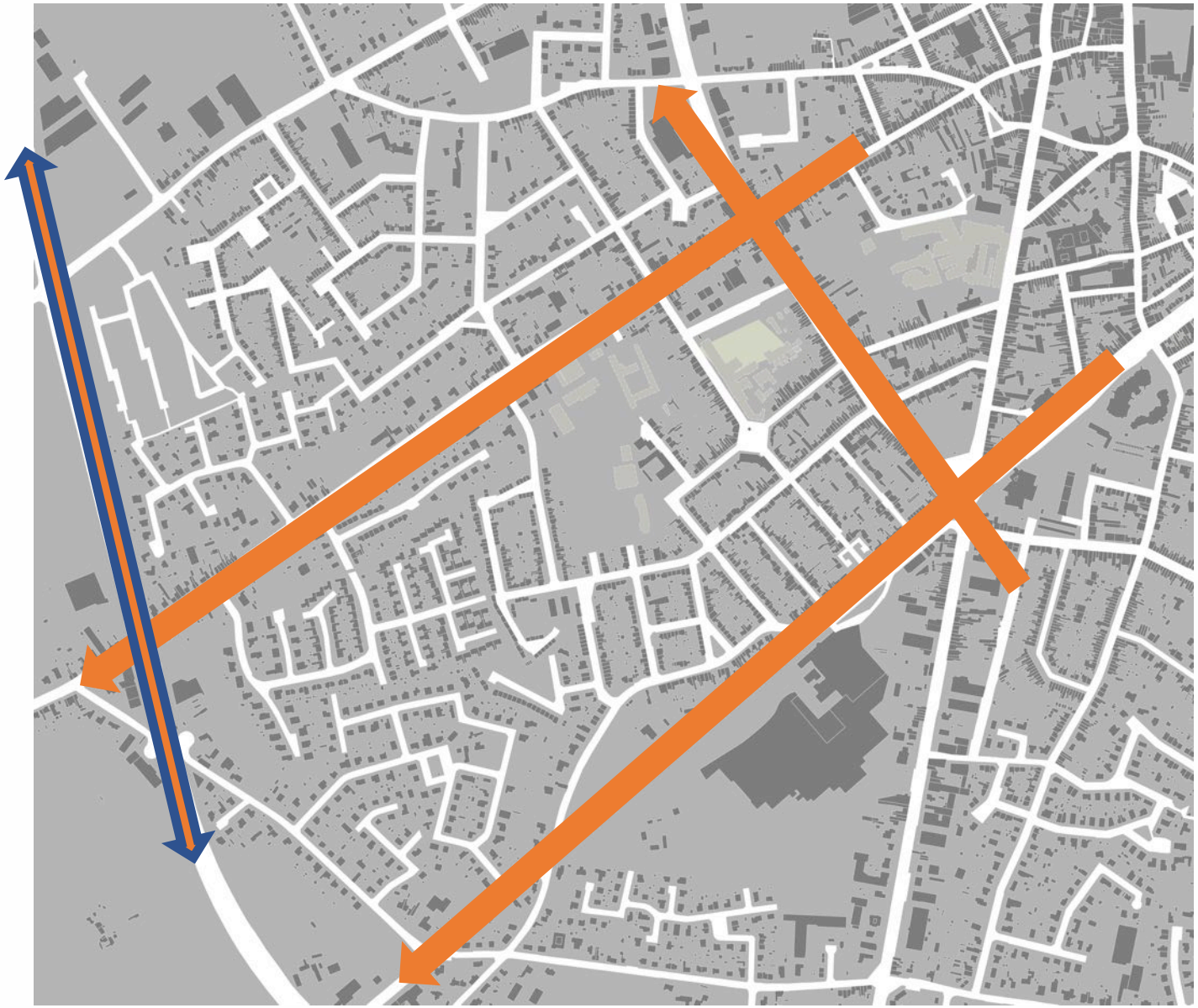
No cafes

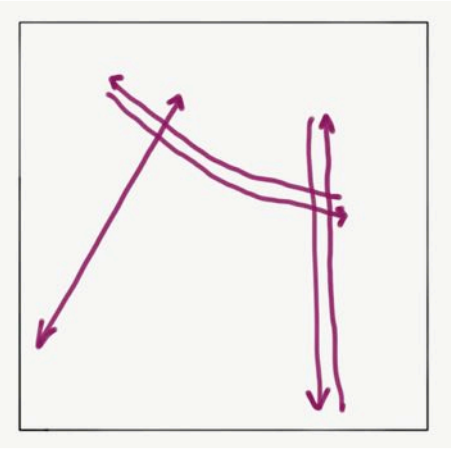
No civic functions

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

Urban Analysis



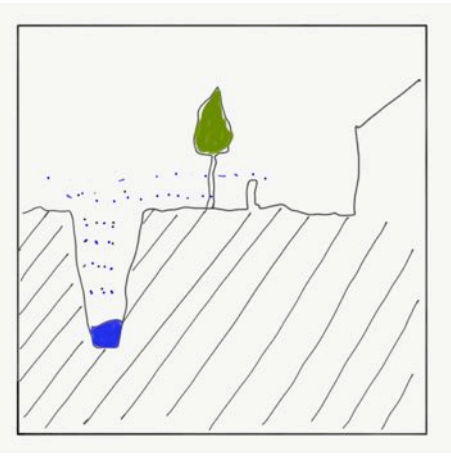


Over-engineered Roads

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

Urban Analysis



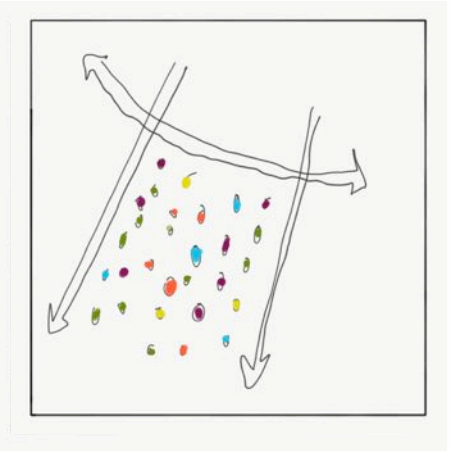
Over-engineered water ways

Flooding an issue

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

Urban Analysis



Empty but full

75 Homes/Ha

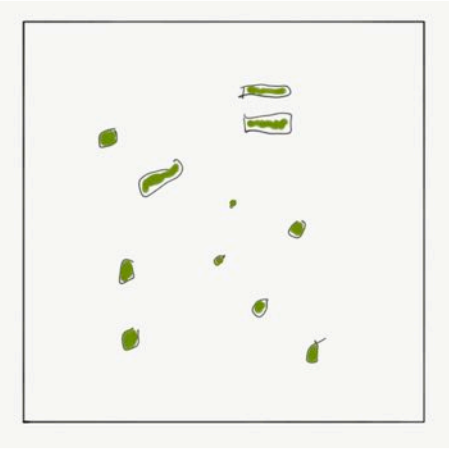
17 Hectares

68 Hectares empty

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

Urban Analysis



Small green spaces

Indvidual gardens

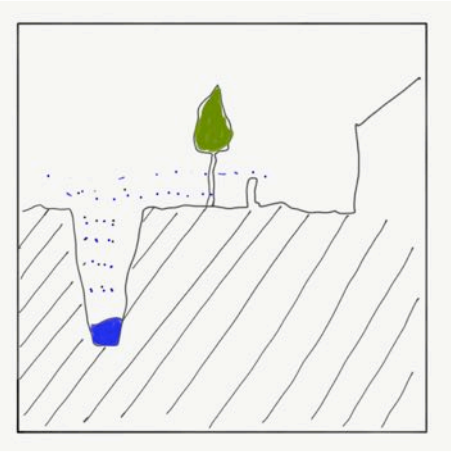
Grass verges

Road infrastructure

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

Urban Analysis



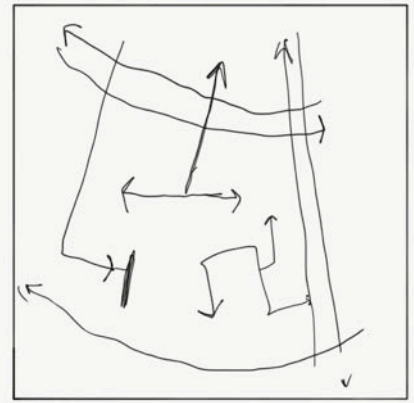
Over-engineered water ways

Flooding issues

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

Urban Analysis



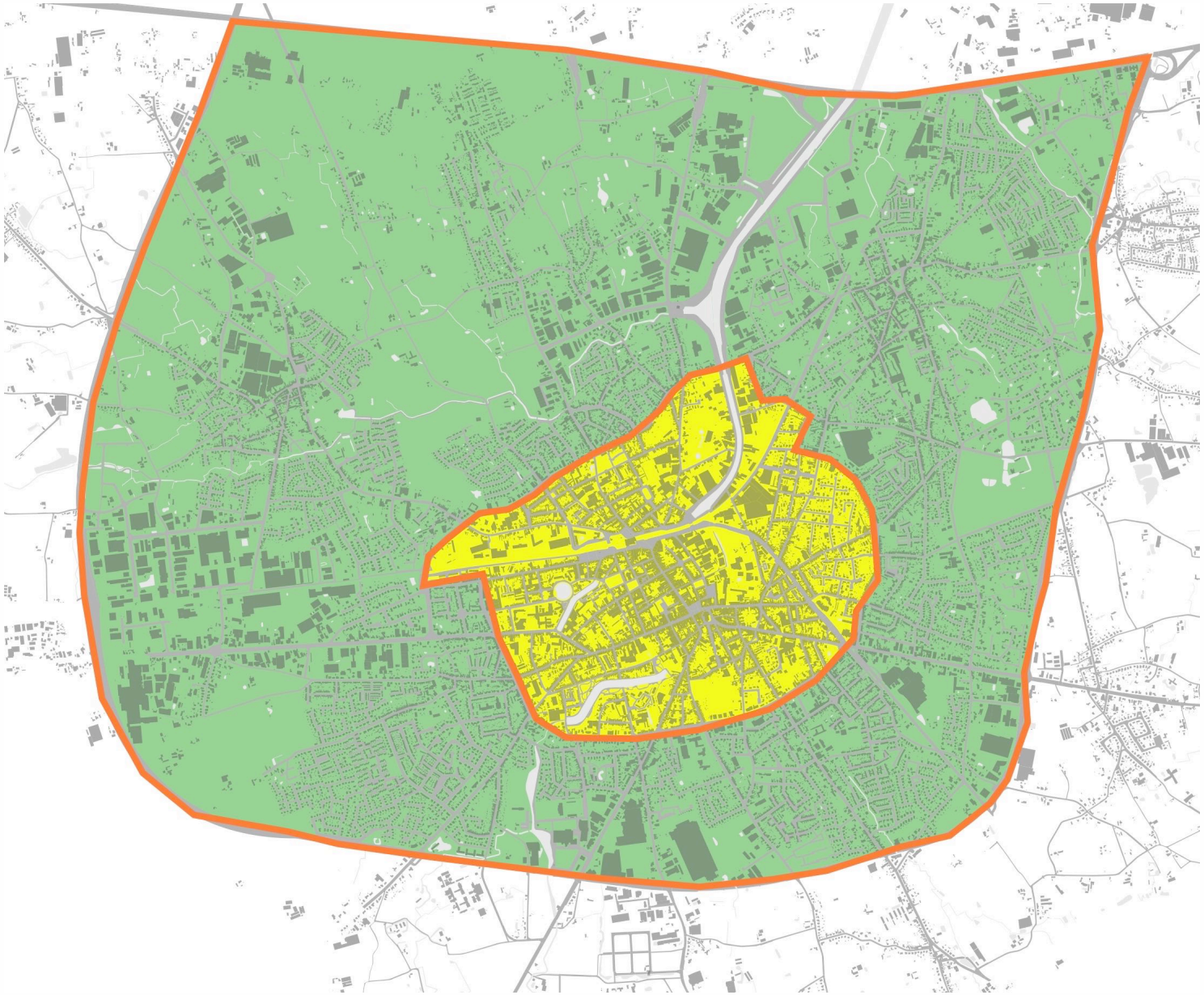
Car-orientated

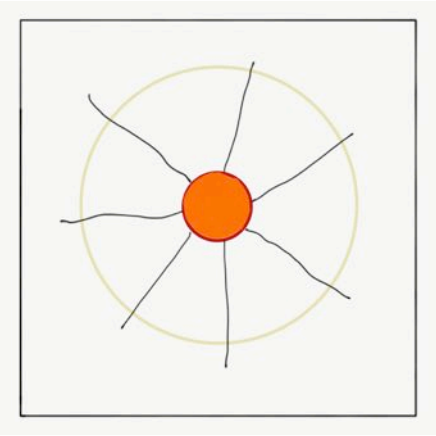
Highest mobility impact

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

Urban Analysis





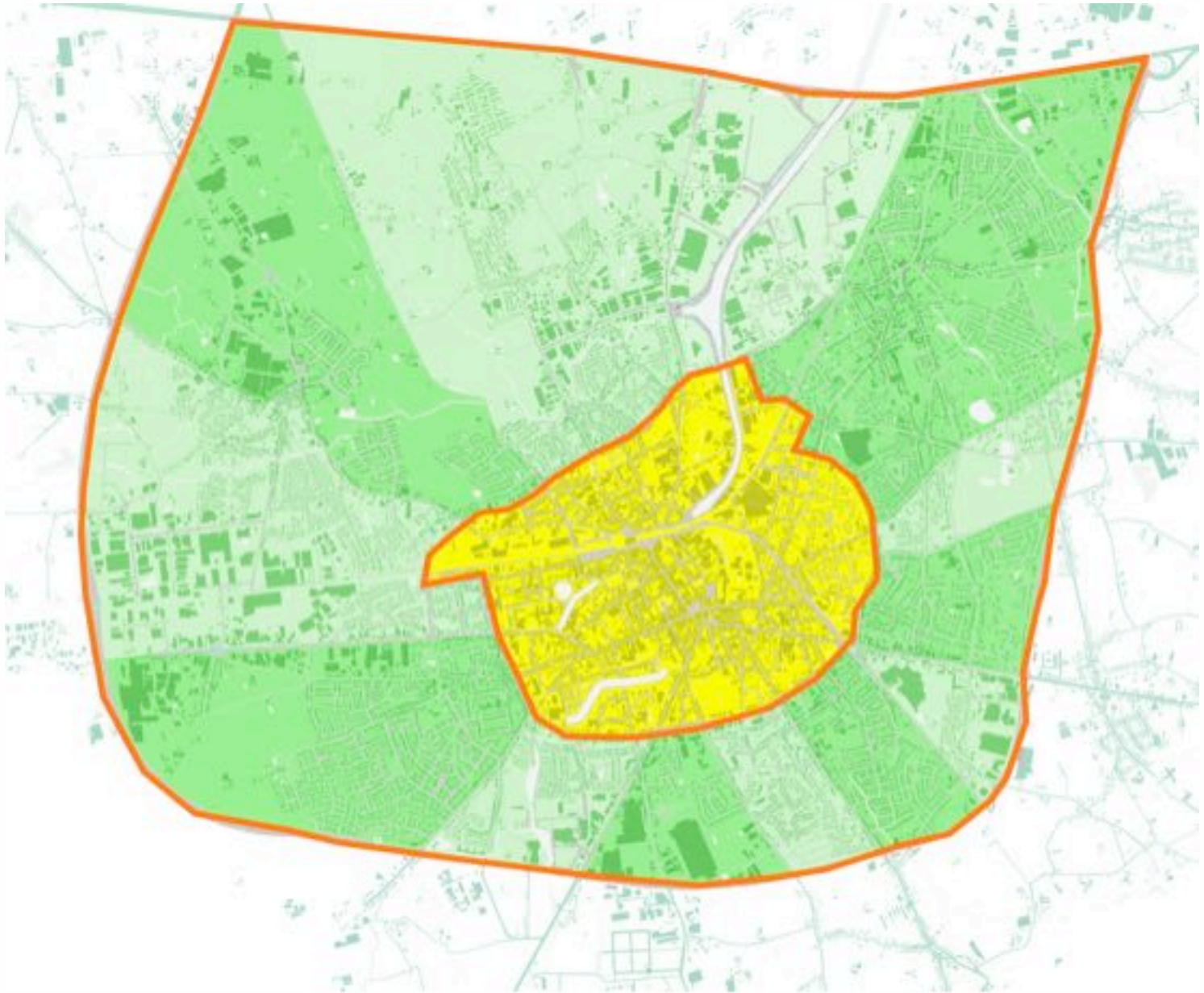
Egg-like structure

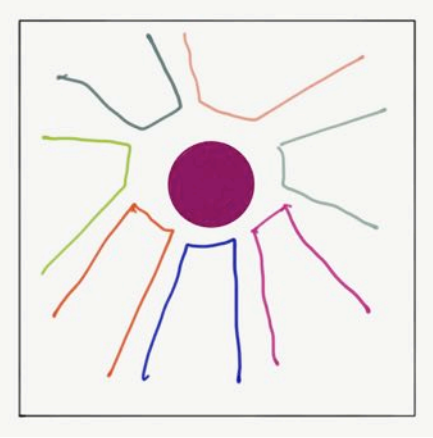
Neighbourhood is isolated, both from city and nature

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

Urban Analysis





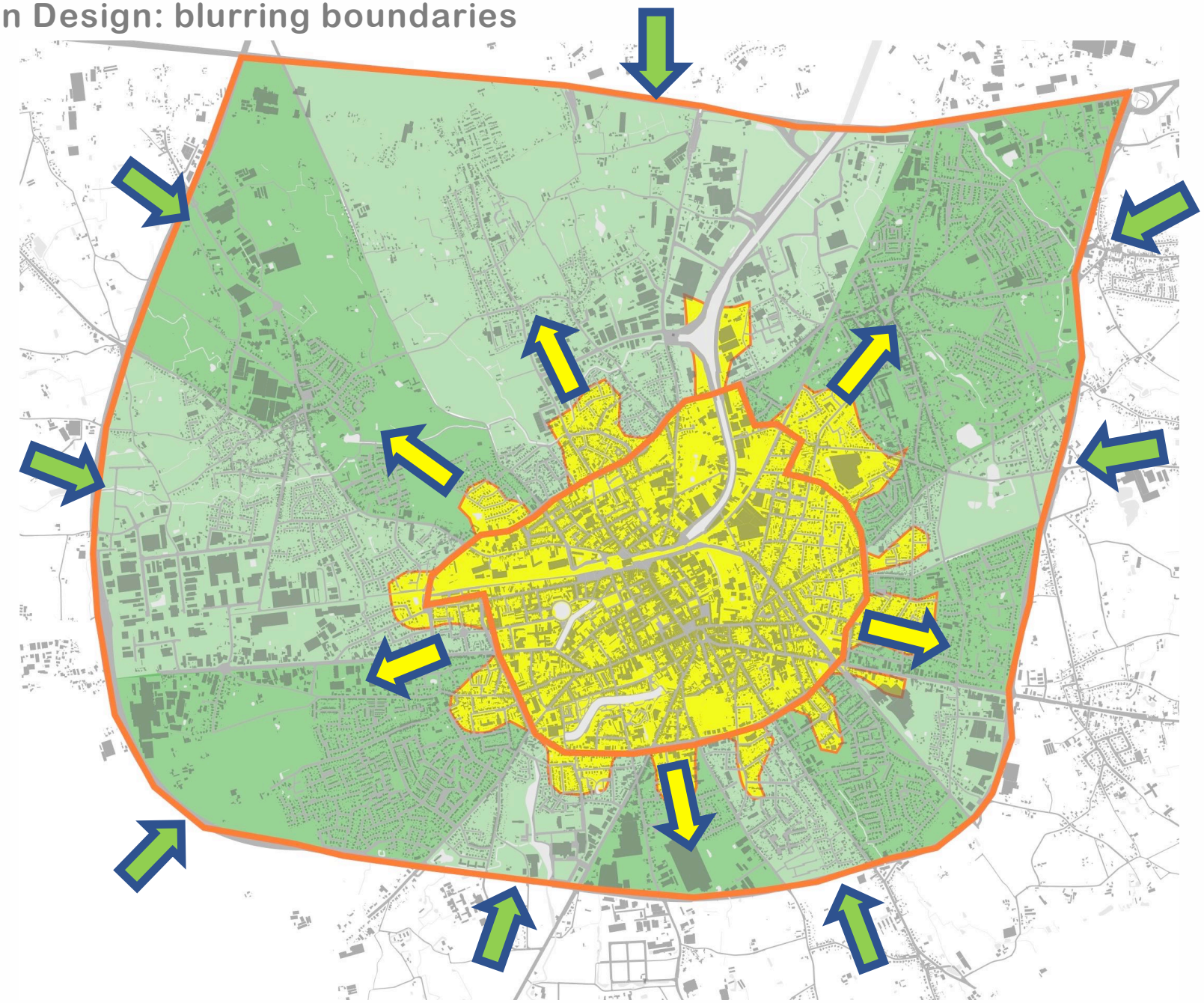
City of bits

Very little contact between neighbourhoods

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

Urban Design: blurring boundaries

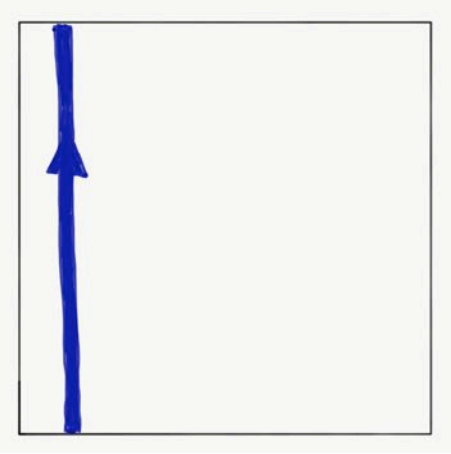


Star-city

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

Urban Analysis

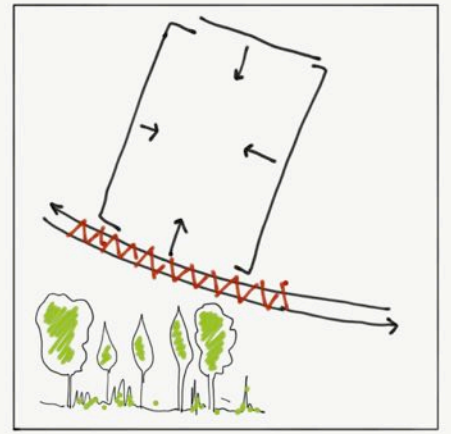


No nature

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

Urban Analysis

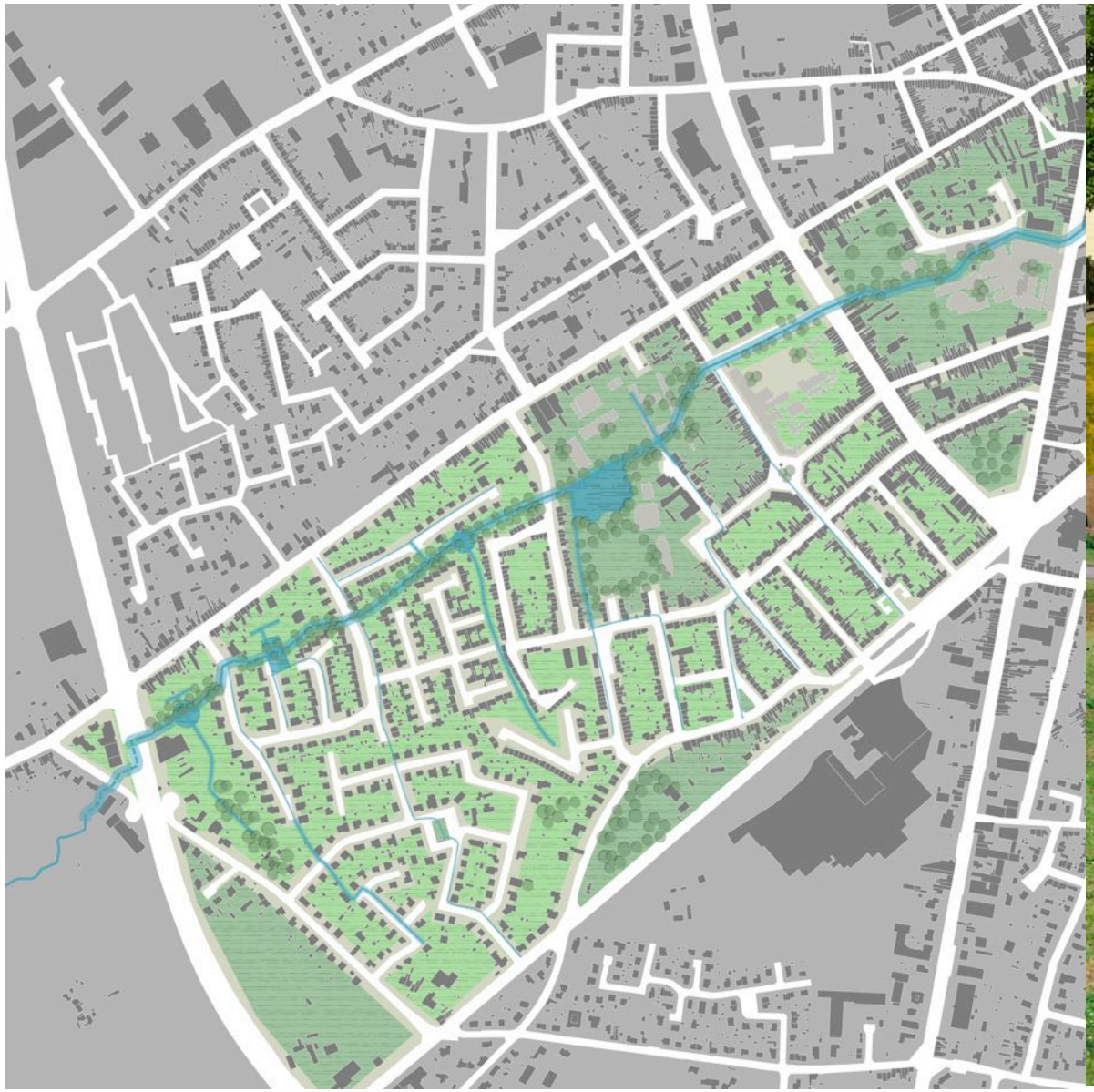


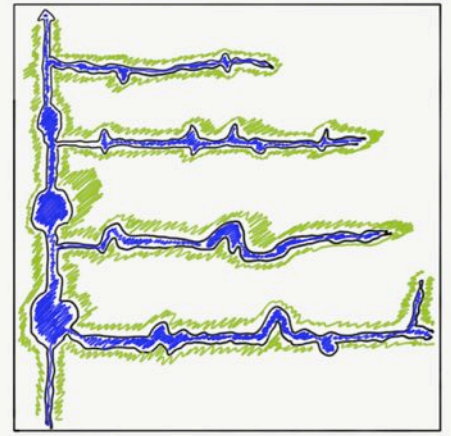
Isolated from nature

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

Urban Design: flood proofing naturally





Sustainable urban drainage

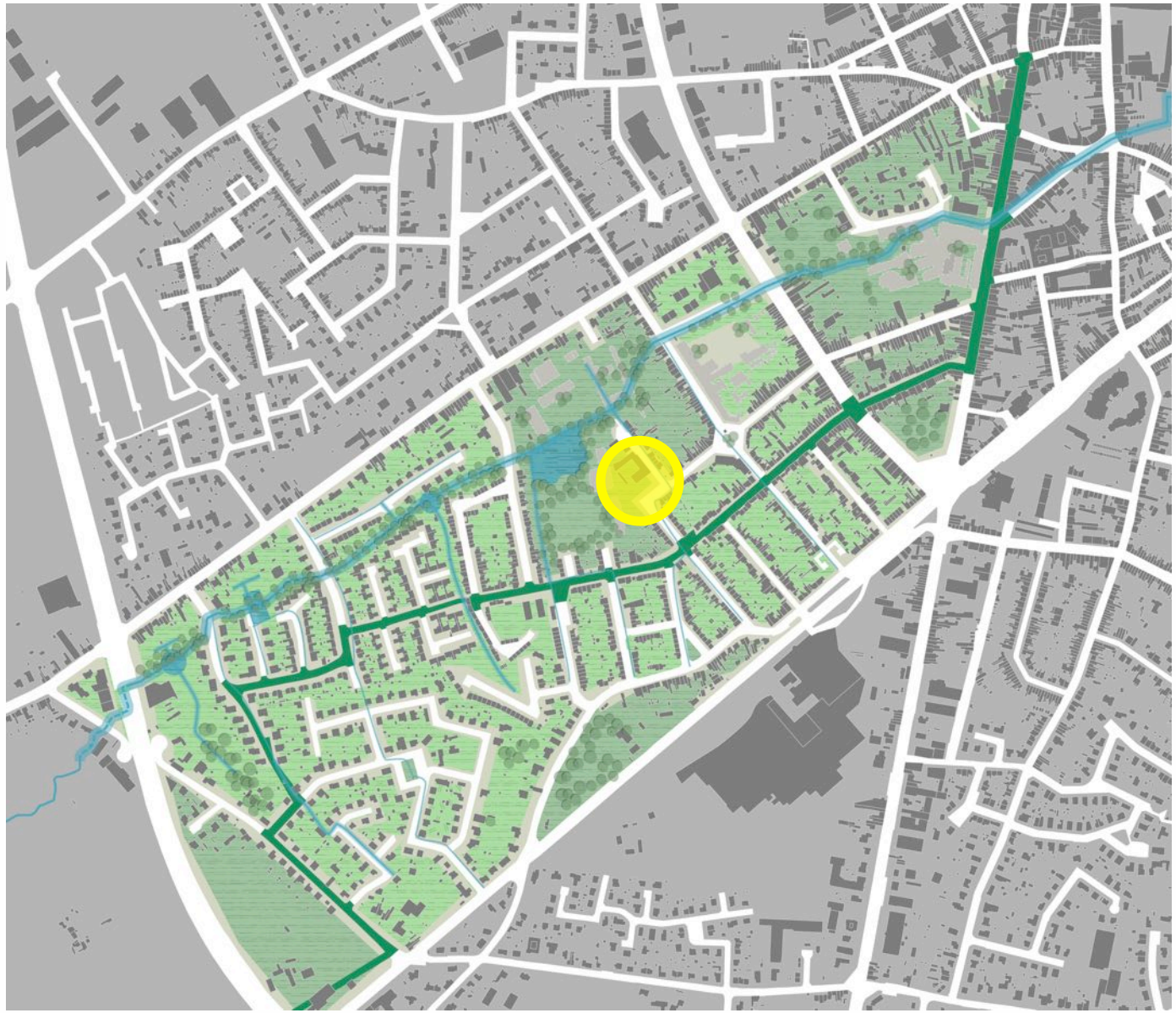
Cheap

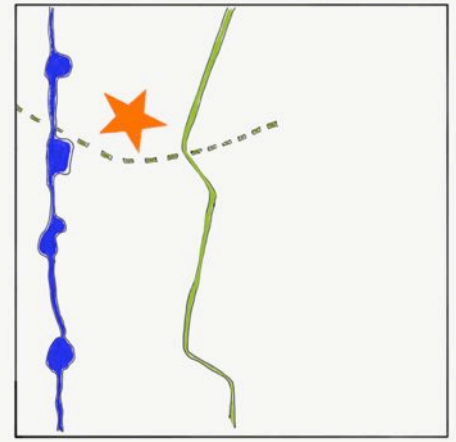
Easy

Bio-diverse

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Urban MOves





Interface between blue and green

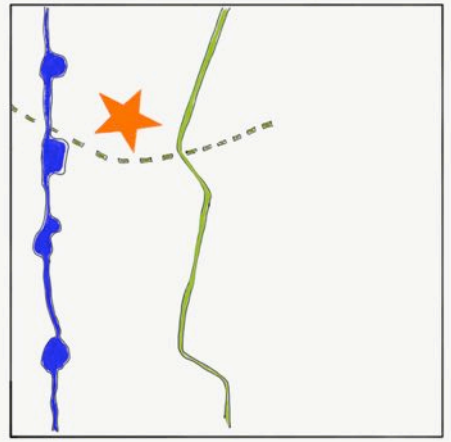
Create blue route

Create Green cycle route

Connect in neighbourhood

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018



Community Agora

Food focussed neighbourhood

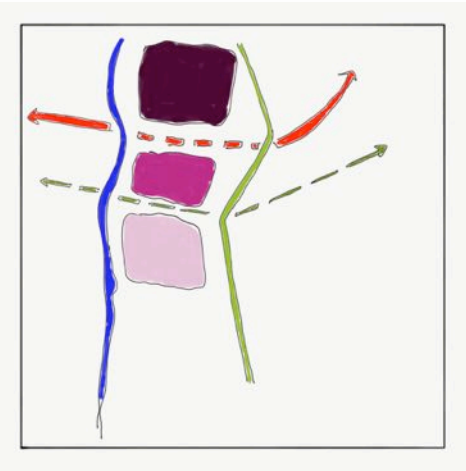
Community food trading

Paddy field

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

Urban Design



Blurred boundaries

Bring city to neighbourhood

Bring neighbourhood to city

Increase density

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Modal shift provides urban space

Source: www.verkehrswende-ev.de

Neighbourhood connectivity

Source: www.wegcode.be

Source: http://www.iedereengorilla.be/

Social

Safe

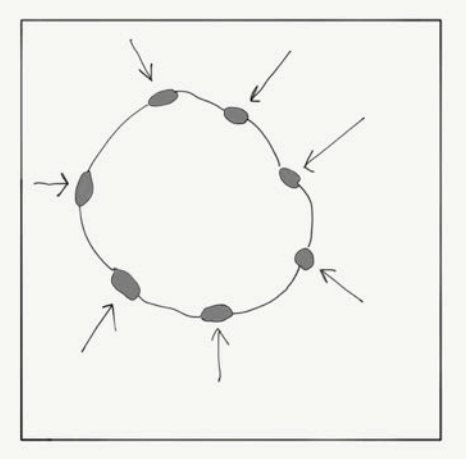
Healthy

CITY-zen
New urban energy

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

Urban Analysis



No need to visit

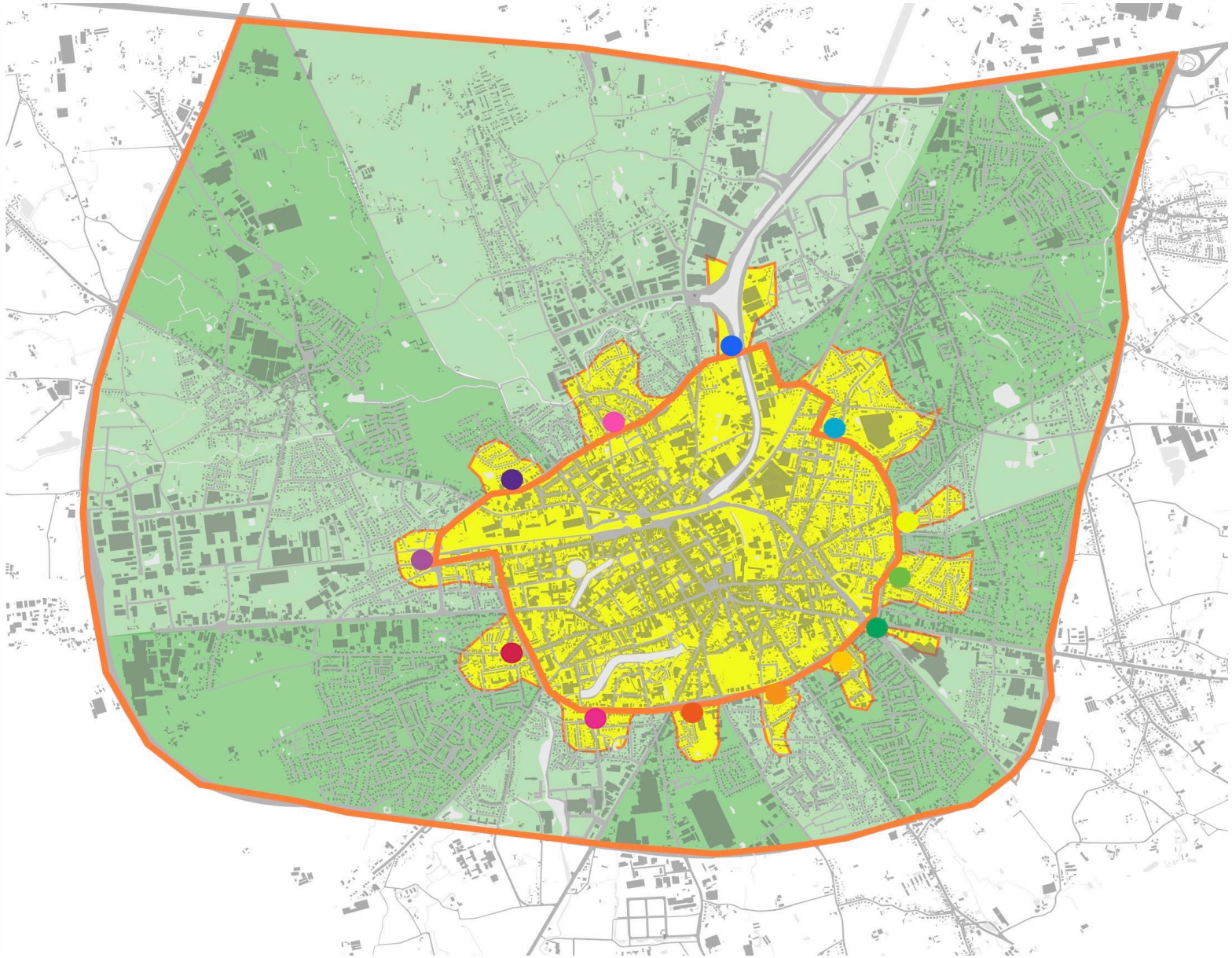
Very generic

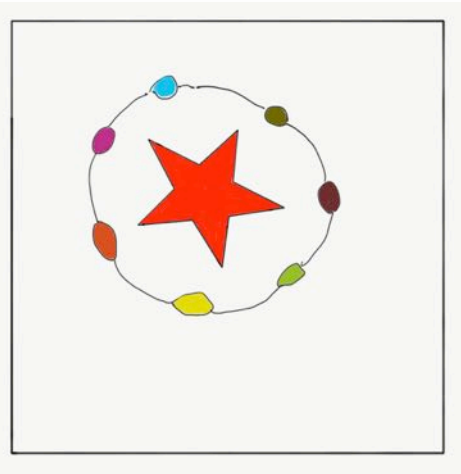
No difference

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

Urban Design: New green ring of exciting neighbourhoods





New green ring

Lots of reasons to visit!

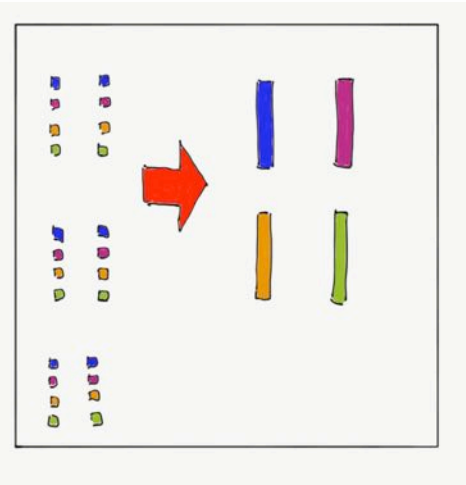
Each neighbourhood is individual and productive!

CITY-zen
New urban energy

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

Urban Proposal Super sharing, low impact, urban agriculture neighbourhood

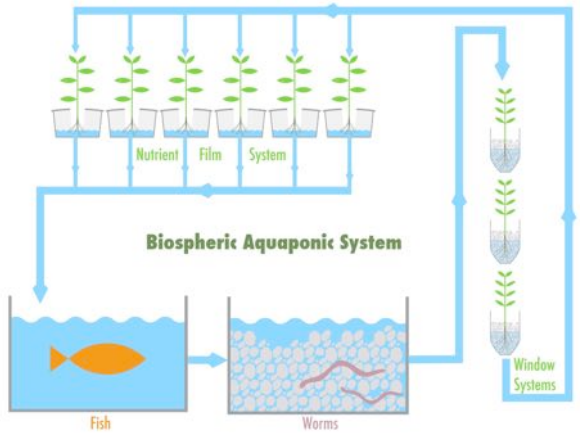


Shared surface

Productive

Flood proof

Community focussed

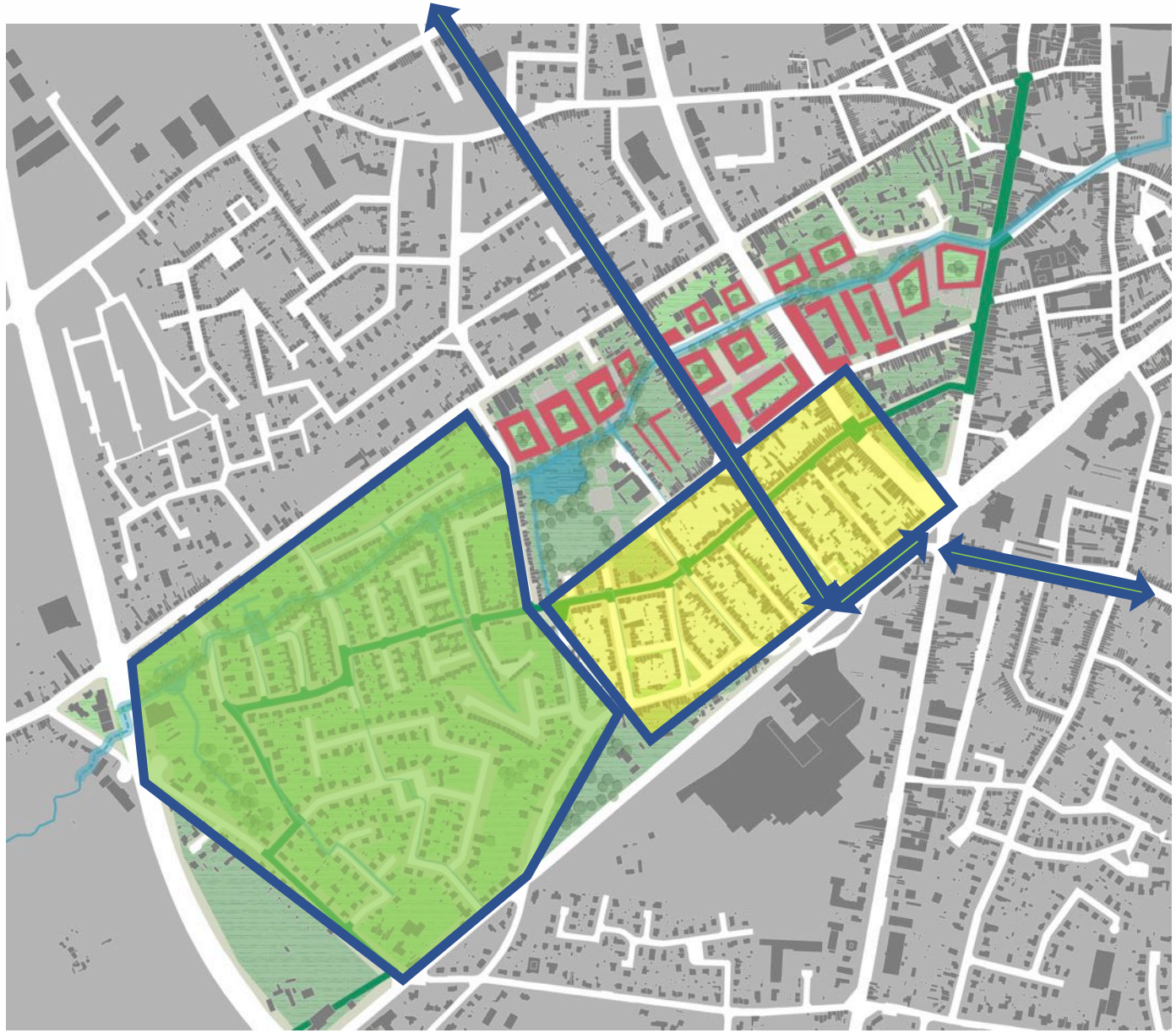


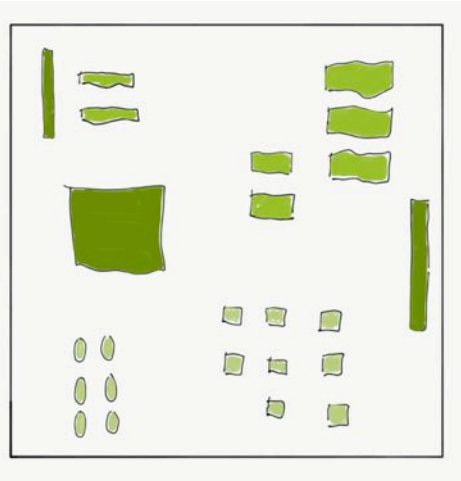
Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

CITY-zen
New urban energy

Roeselare, Belgium. April 2018

Urban agriculture: low impact with technical food systems





Productive Landscapes

Urban Castles

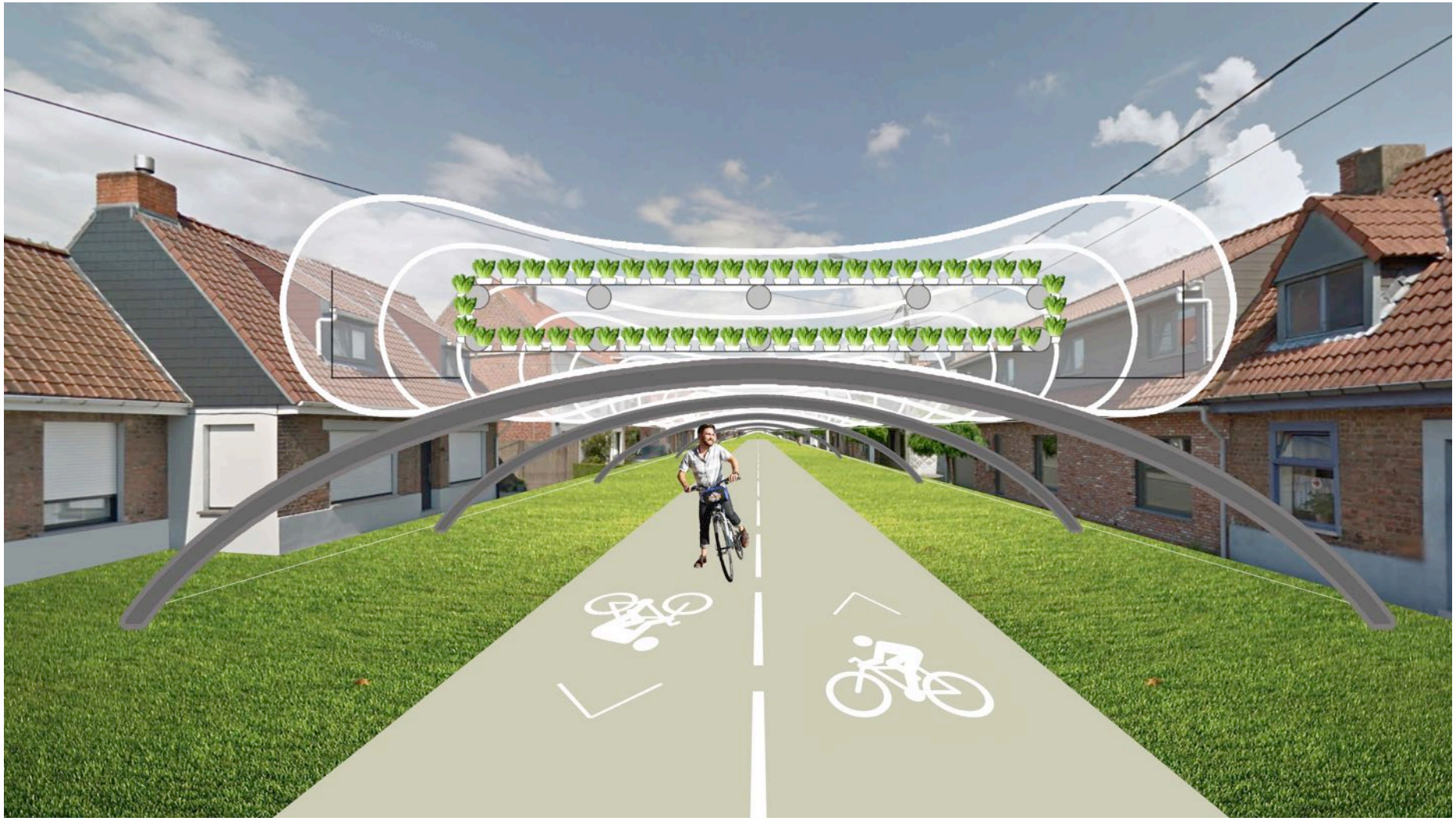
Productive street systems

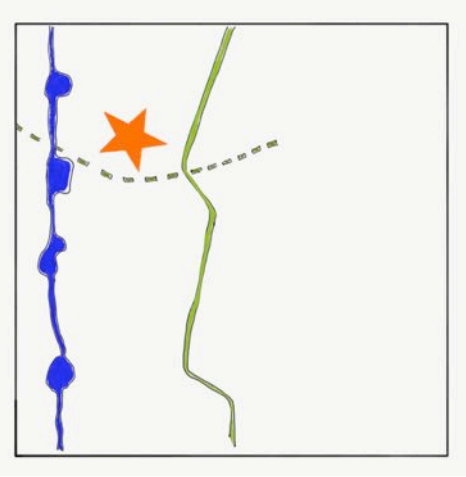
Techno terps

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

Urban Design. Aquaponic people first highways





Urban Agriculture everywhere

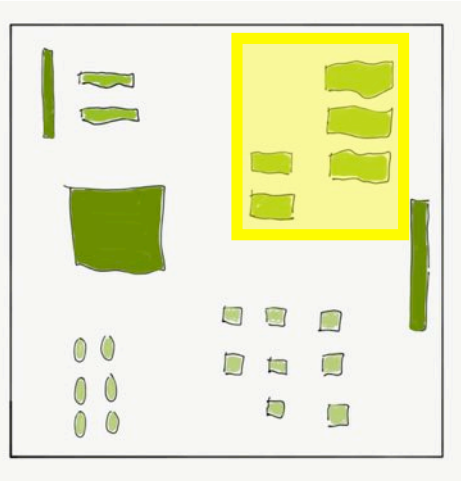
Aquaponic cycleway

CITY-zen
New urban energy

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

Urban Design - Blue Green castles



Consolidation of green space

Energy renovation

Urban Agriculture

Community focussed

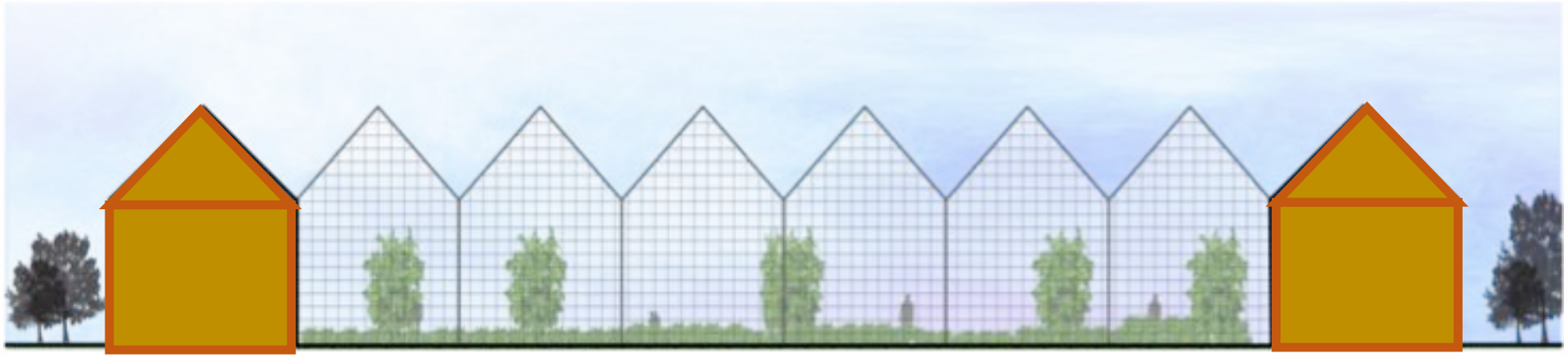
Sharing

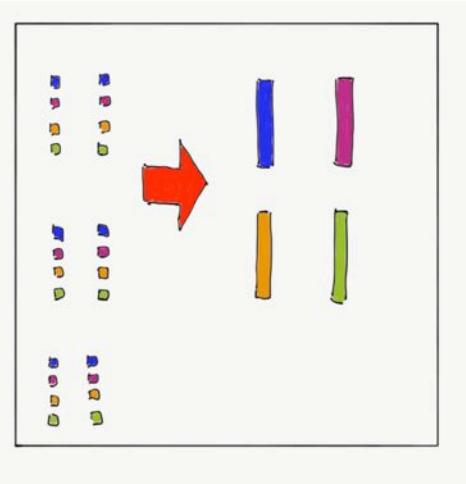
CITY-zen
New urban energy

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

Urban Design - Blue Green castles





Sharing

Energy

Food

Community

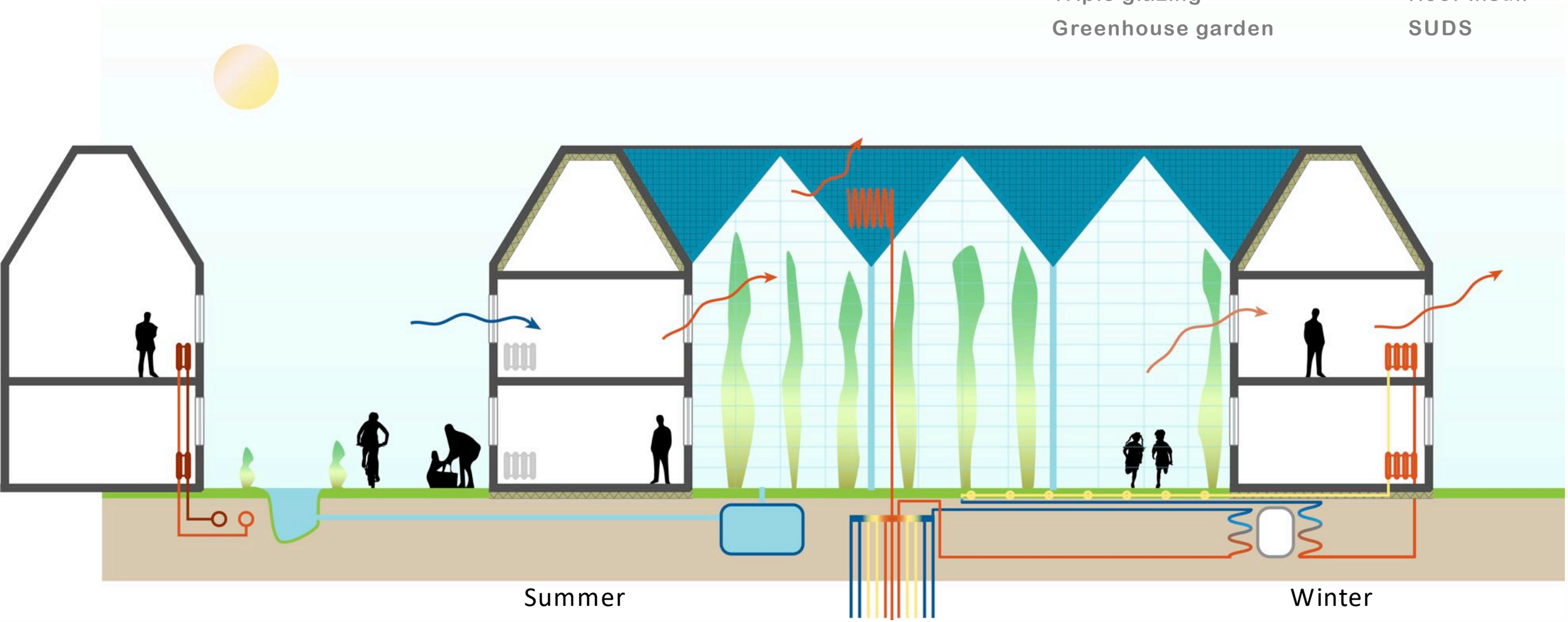
Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

All-electric self-sufficient renovation – *Green blue castle*

Main measures

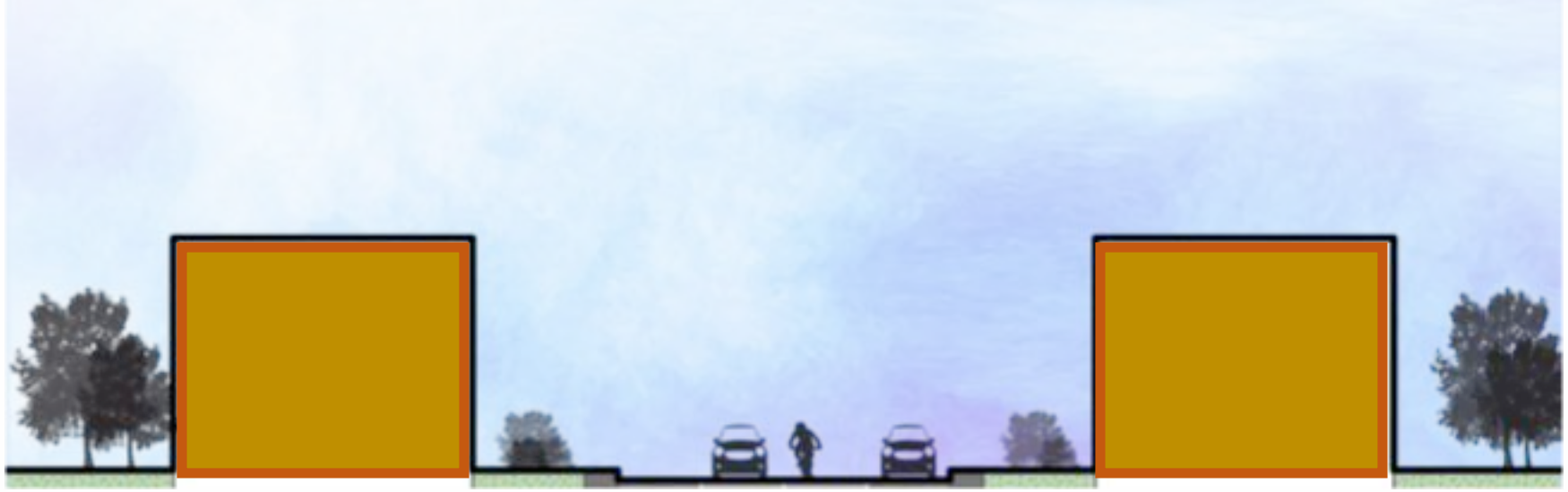
- PV-Thermal roof
- Collective Heat pump
- Triple glazing
- Greenhouse garden
- BTES
- DHW booster
- Roof insul.
- SUDS

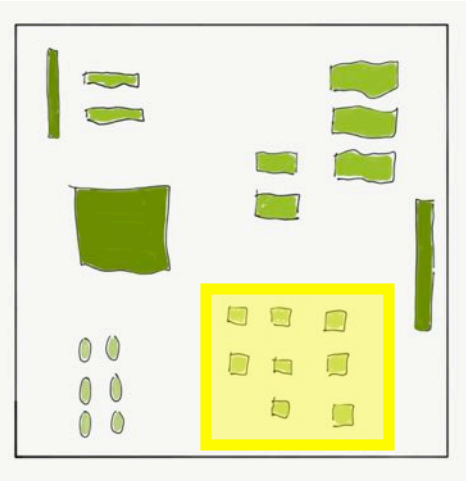


Energy strategy: Siebe Broersma MSc, Technical University, Delft.

Roeselare, Belgium. April 2018

All-electric self-sufficient renovation – *Techno terp*





Consolidation of green space

List 1

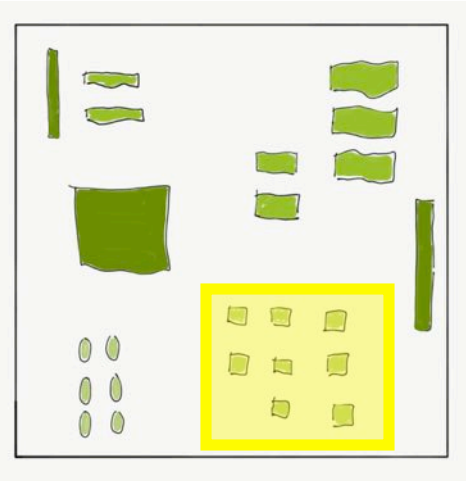
List 2

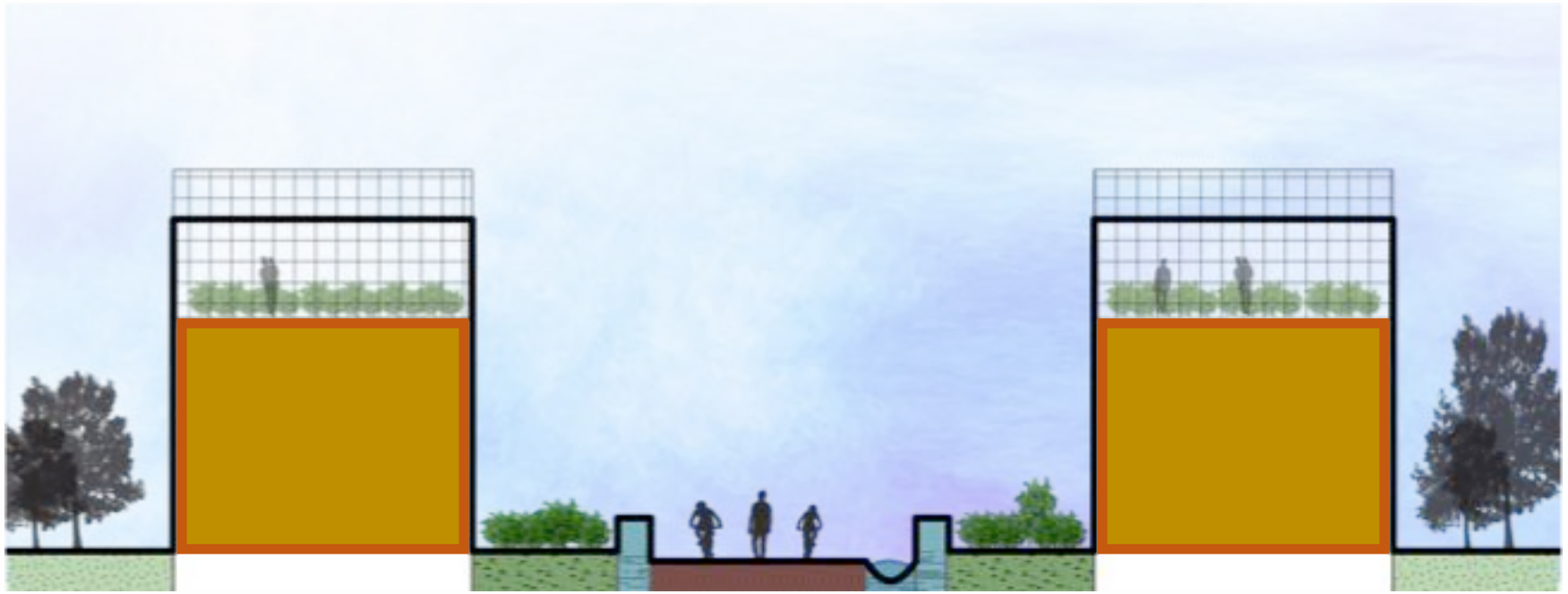
List 3

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

All-electric self-sufficient renovation – *Techno terp*





Techno terps

Technical food system with aquaponics

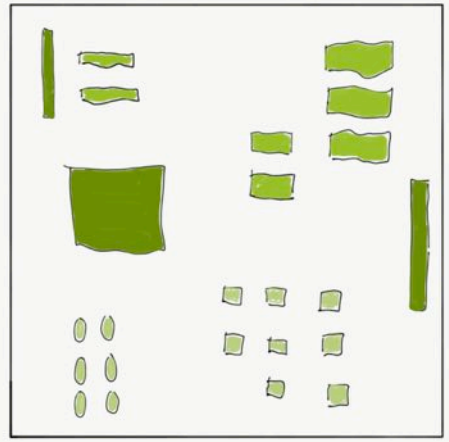
Fishtanks provide flood protection

Bio-swales in street

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

All-electric self-sufficient renovation – *Techno terp*



Techno terp

Independent energy

Aquaponic greenhouse

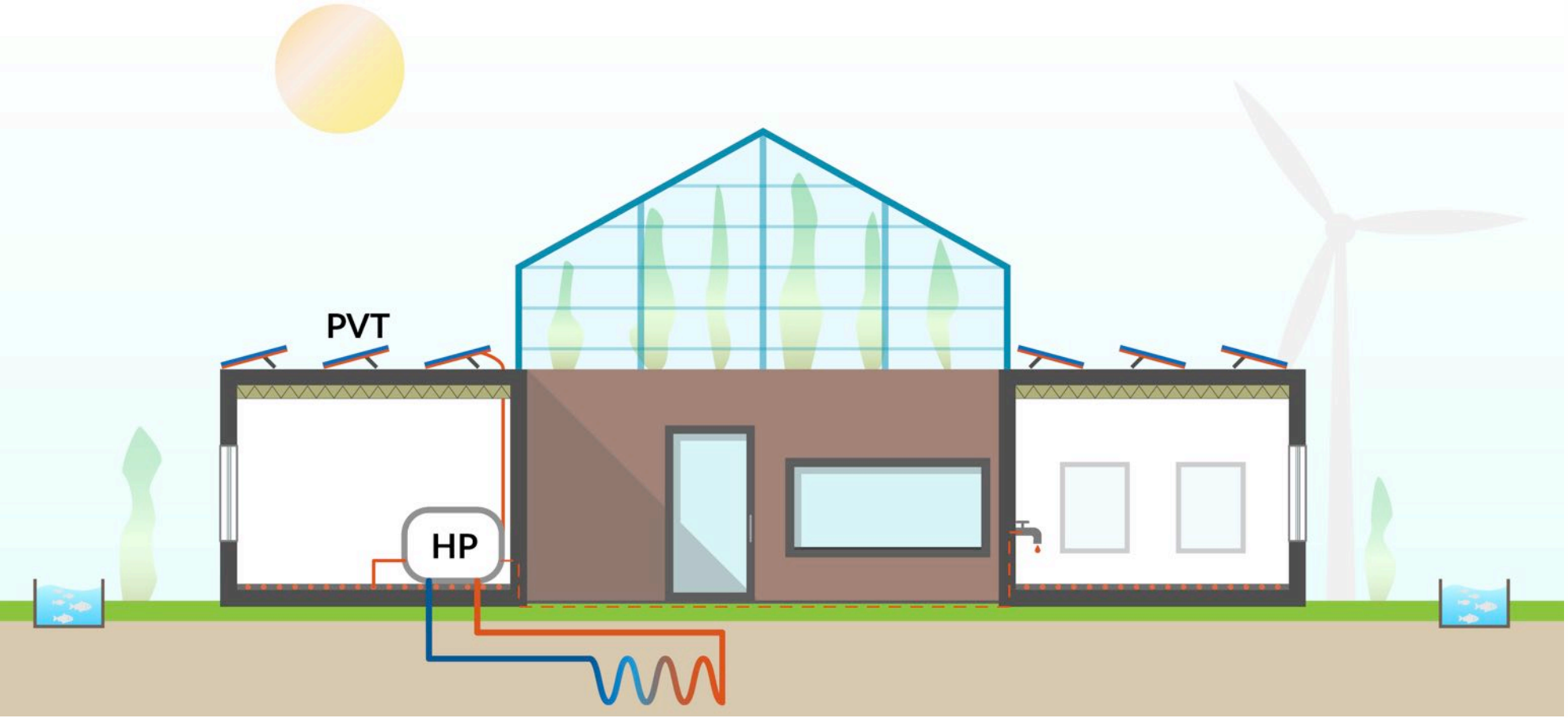
Fish-tank flood barrier

SUDS

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

All-electric self-sufficient renovation – *Techno terp*



Main measures

PV-Thermal roof

Underground heat storage

Ground source HP

DHW booster

Greenhouse roof

Triple glazing + roof insul.

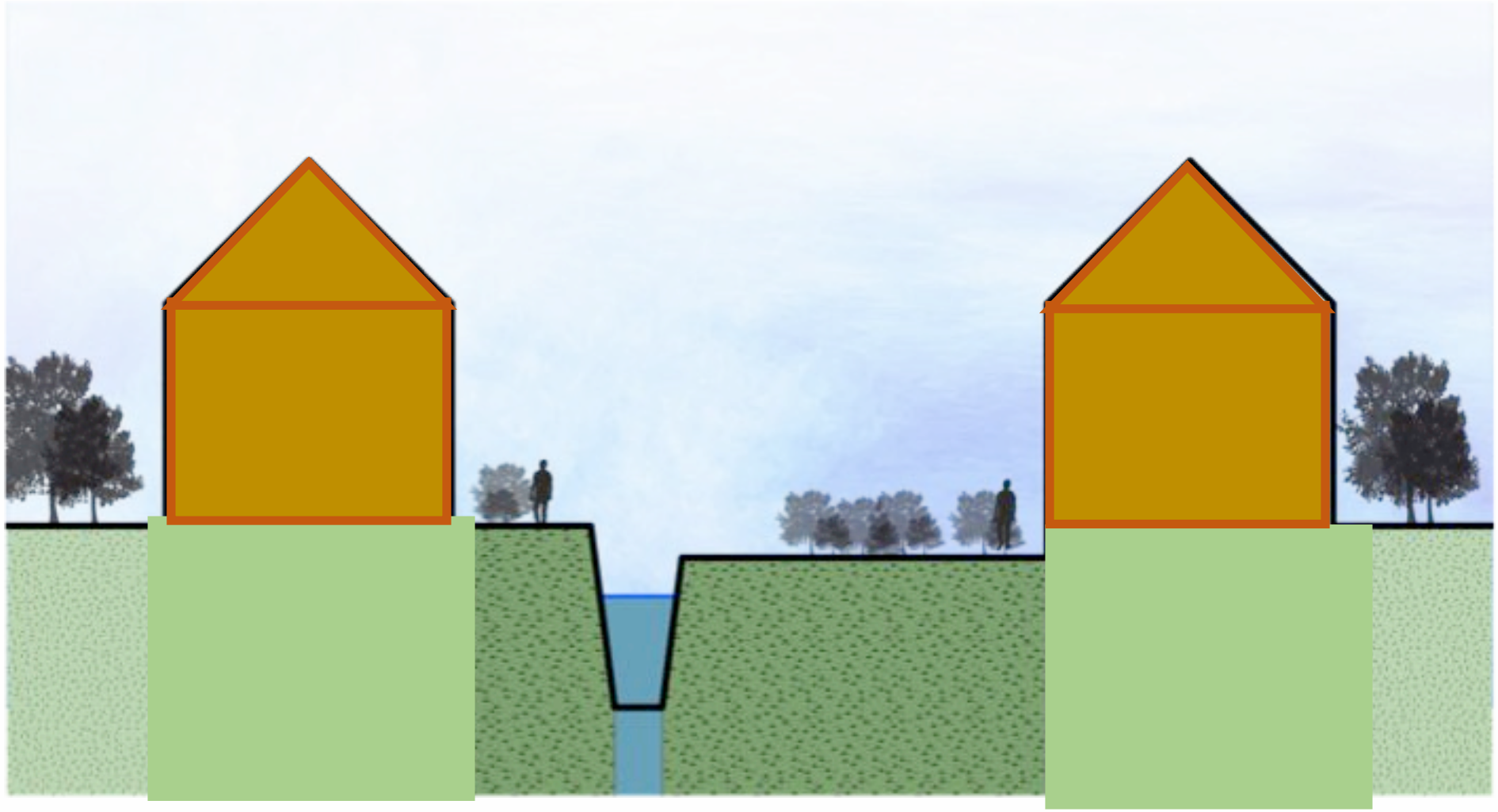
Aquaponics

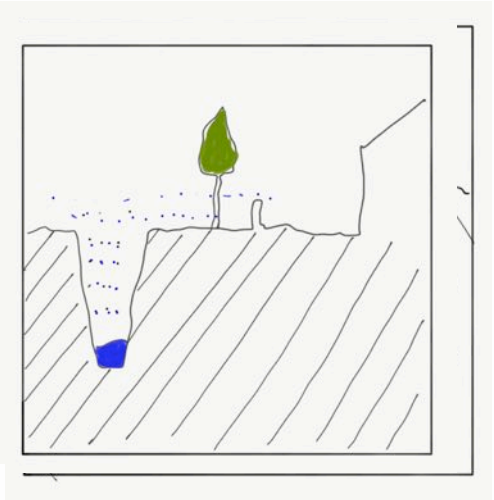
CITY-zen
New urban energy

Energy strategy: Siebe Broersma MSc, Technical University, Delft.

Roeselare, Belgium. April 2018

Urban Design



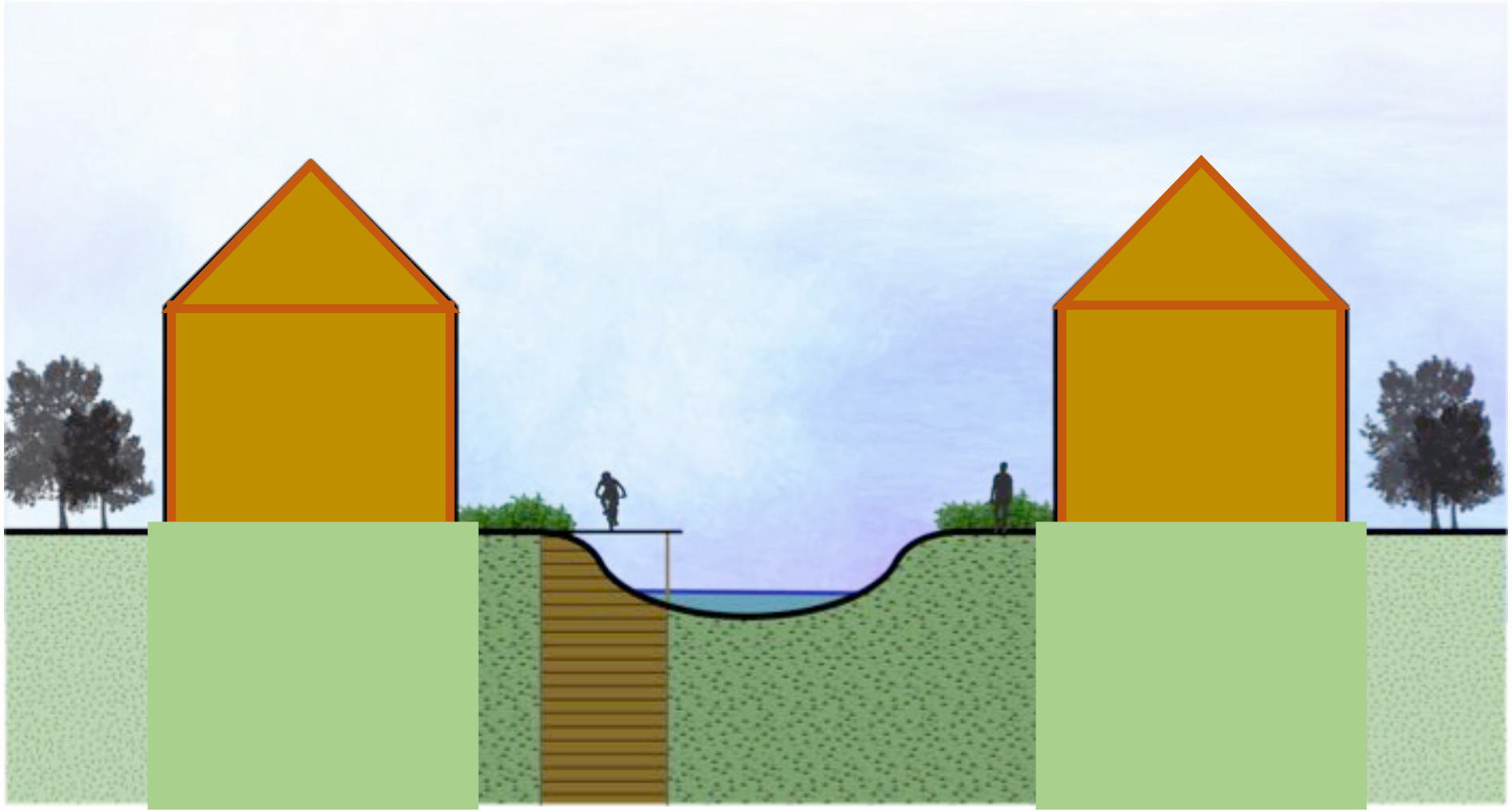


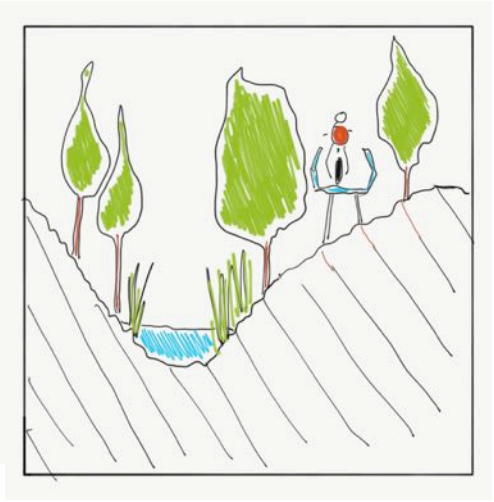
Unsafe and unnatural

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

Urban Design



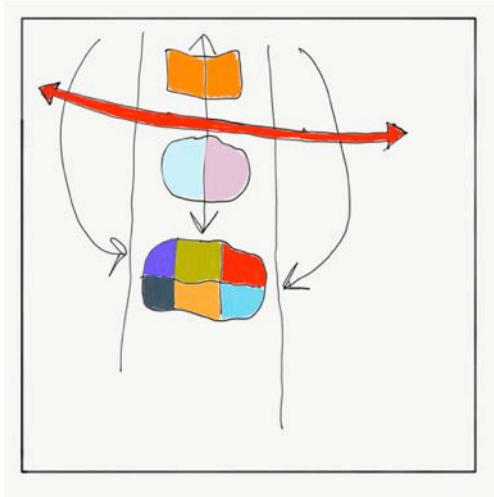


Safe and Natural

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

Urban Design



Unpacking the city into the neighbourhood

Increased intensity

Community services

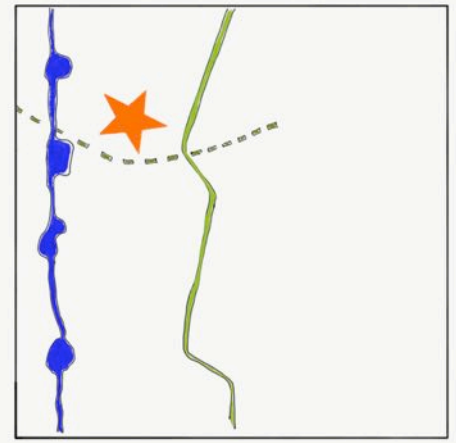
Increased density

Reason to visit

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

Food-LETTS Agora



Community Agora

Food focussed neighbourhood

Community food trading

Paddy fiels

CITY-zen
New urban energy

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

All-electric self-sufficient renovation – *Collievijver agora*

Main measures

PV-Thermal roof

Waste heat from refrigeration

BTES

MT mini heat grid

Greenhouse roof

Water storage

Full PV-roof

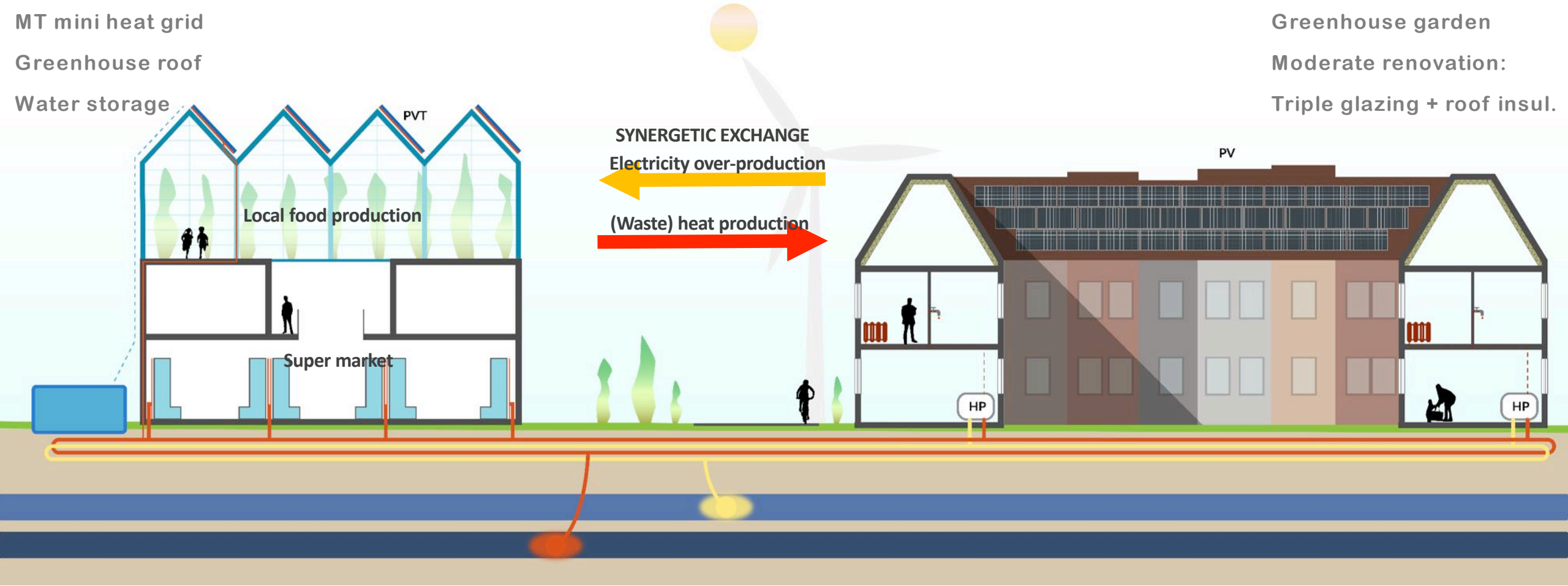
Collective Heat pump

DHW booster

Greenhouse garden

Moderate renovation:

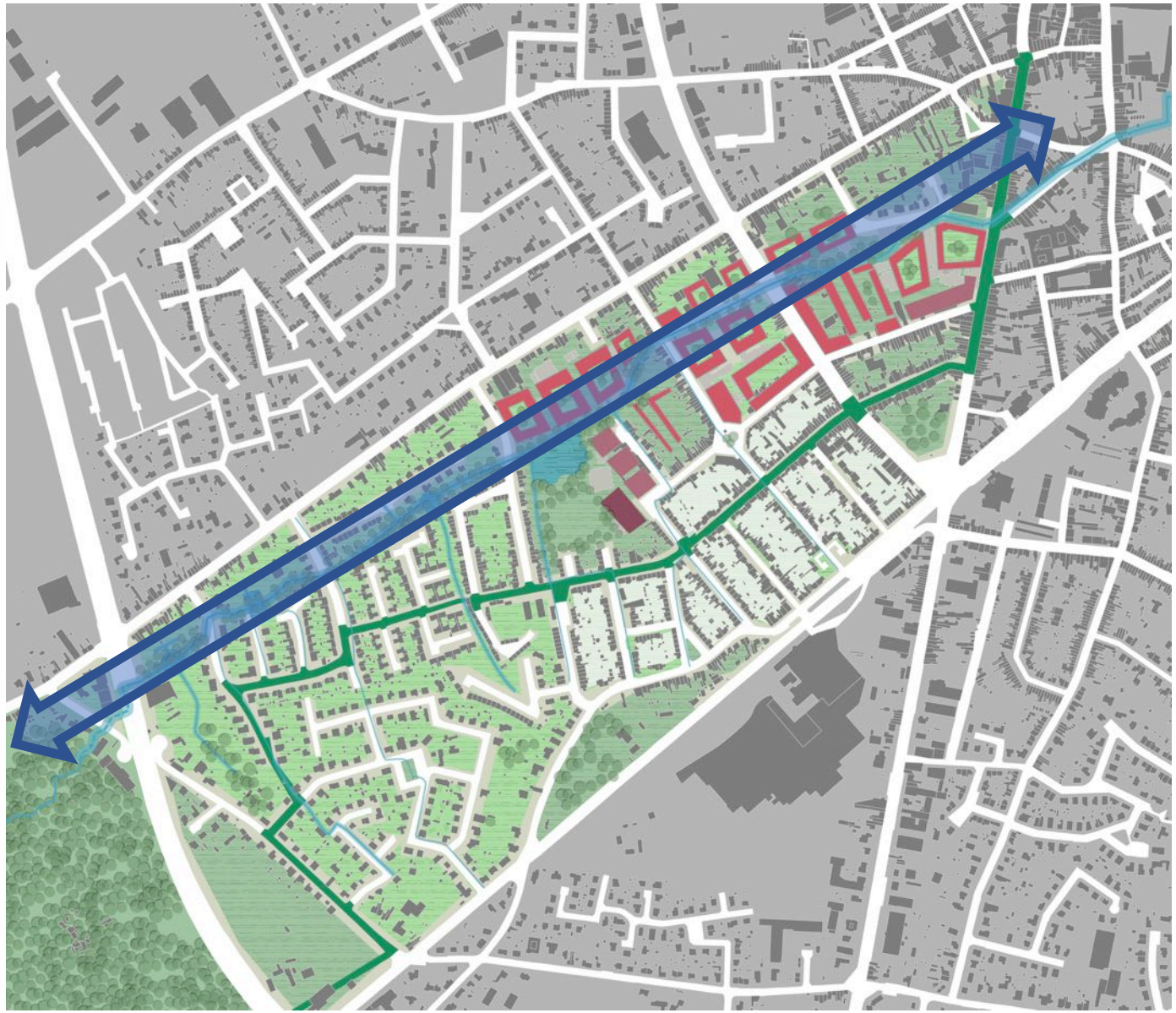
Triple glazing + roof insul.

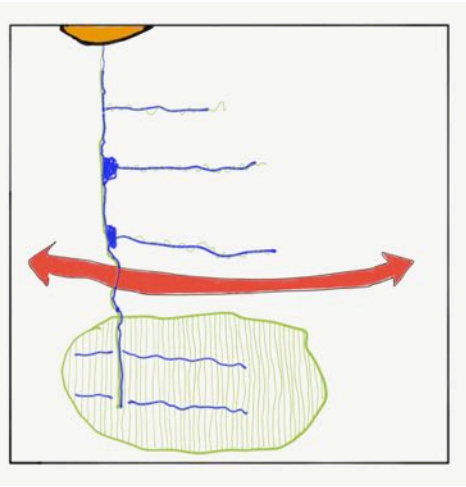


Energy strategy: Siebe Broersma MSc, Technical University, Delft.

Roeselare, Belgium. April 2018

Urban Design: nature reconnection





Enjoy the environmental tax!

Short coppice willow provides carbon sink

Amenity space

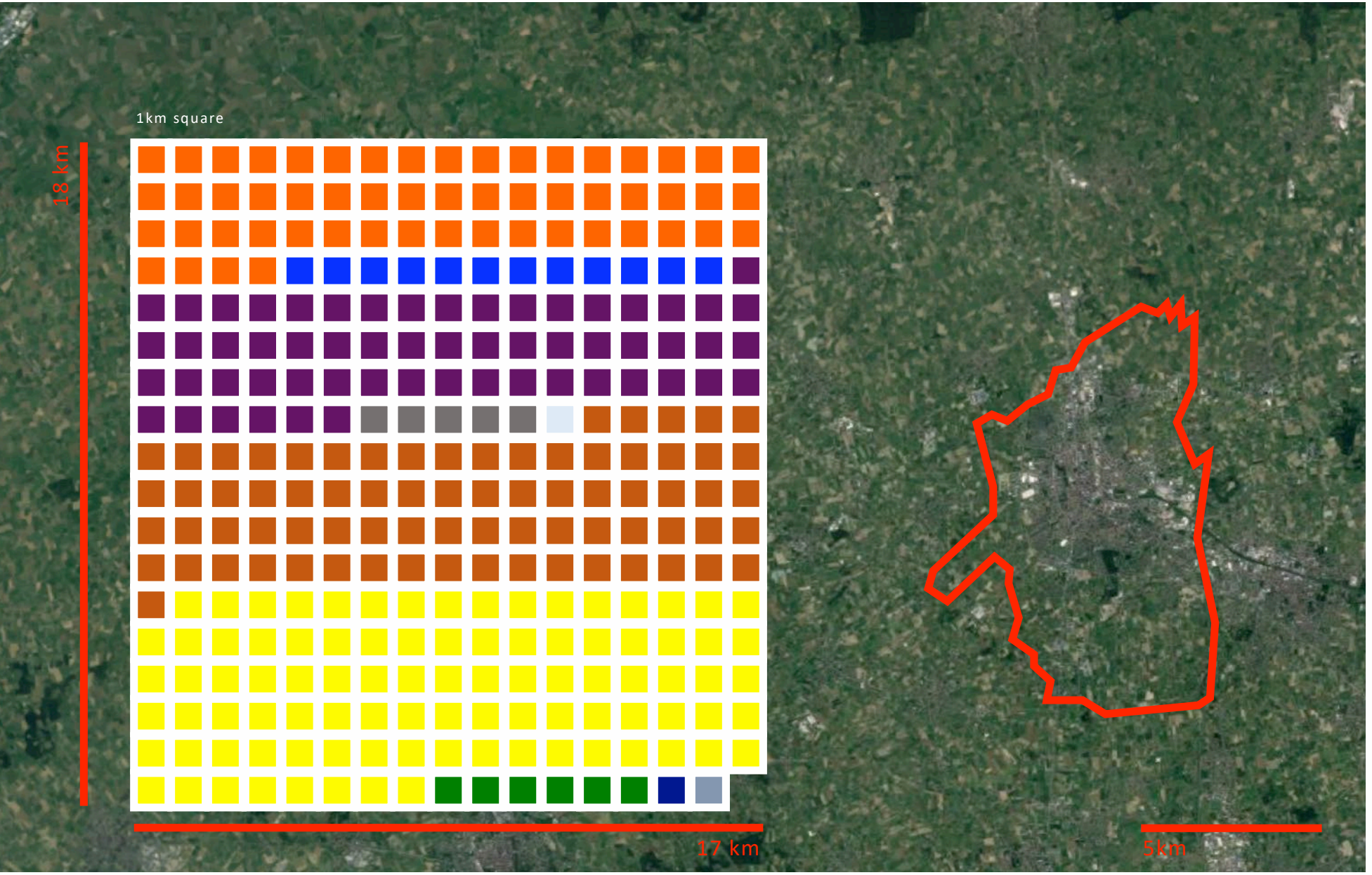
bio-diversity

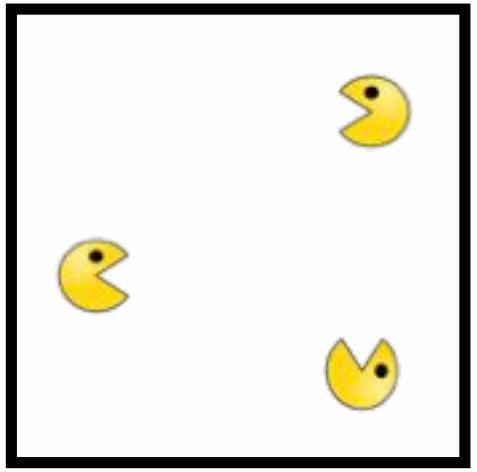
CITY-zen
New urban energy

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





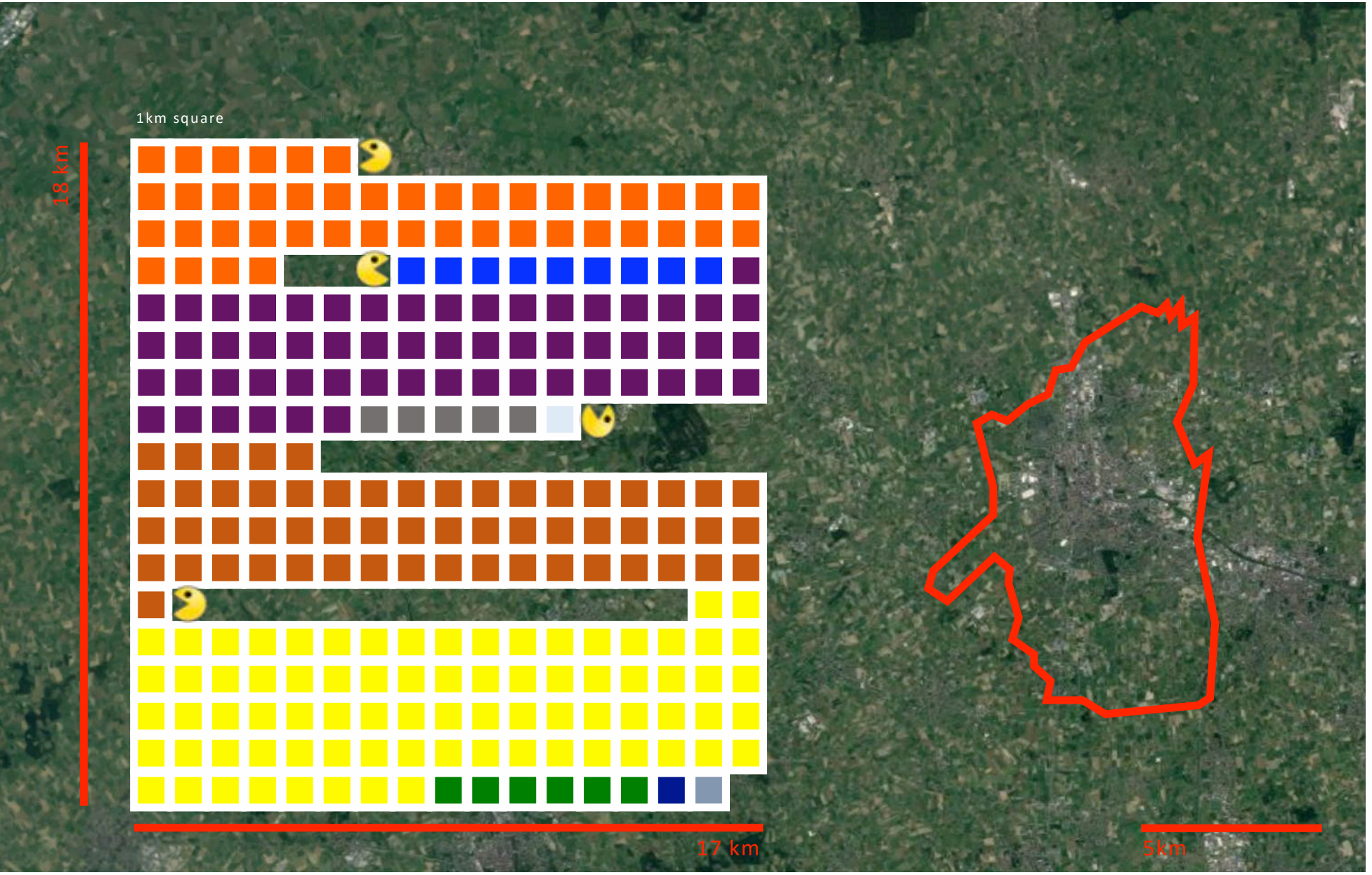
- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- WASTE (URBAN)
- WATER USE (HOUSING)
- TERTIARY
- INDUSTRY
- AGRICULTURE
- Public transport
- Public lighting

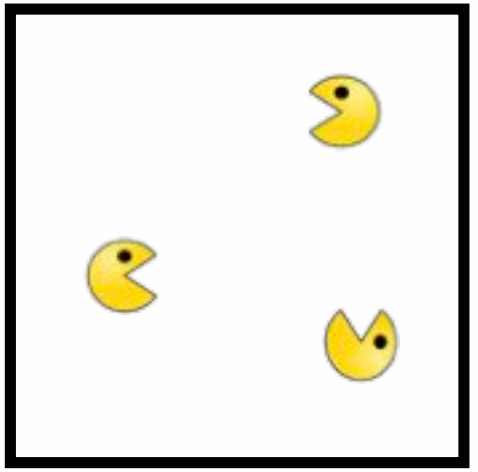
CITY-zen
New urban energy

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #1
ENERGY SAVING
Building energy retrofitting

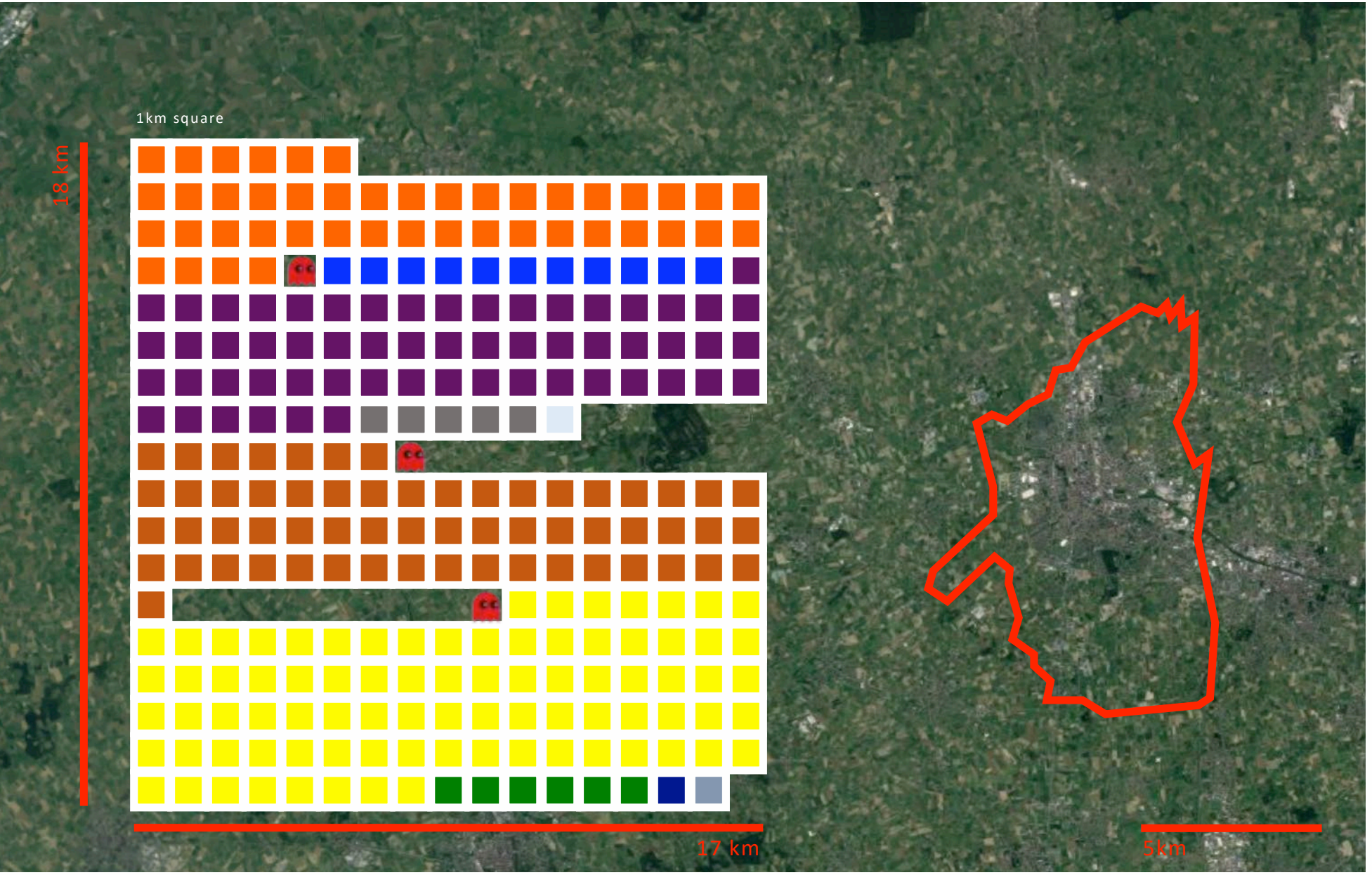
- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

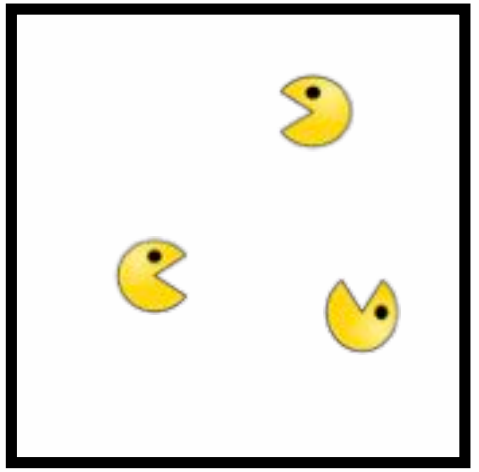
CITY-zen
New urban energy

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





GROWTH
2050 forecast

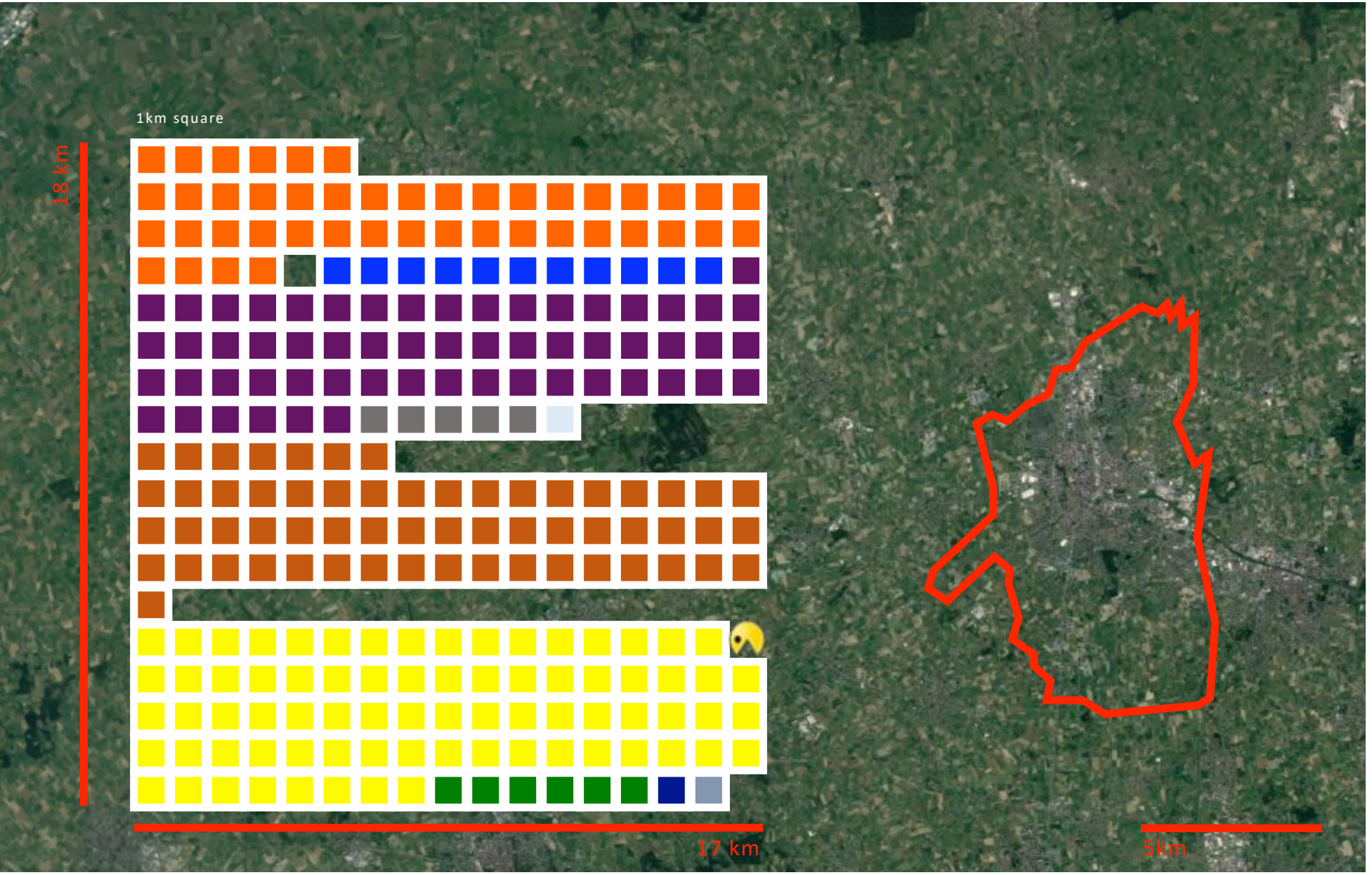
- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

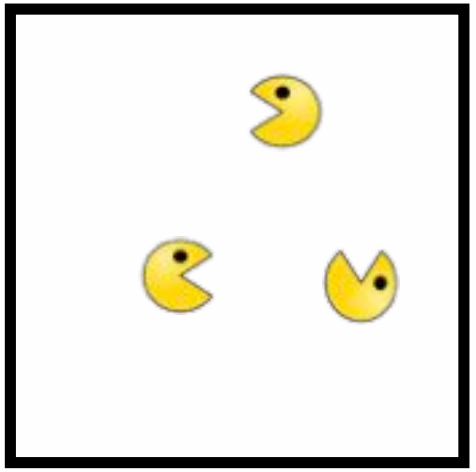
CITY-zen
New urban energy

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #2
BIOMASS
Industrial use

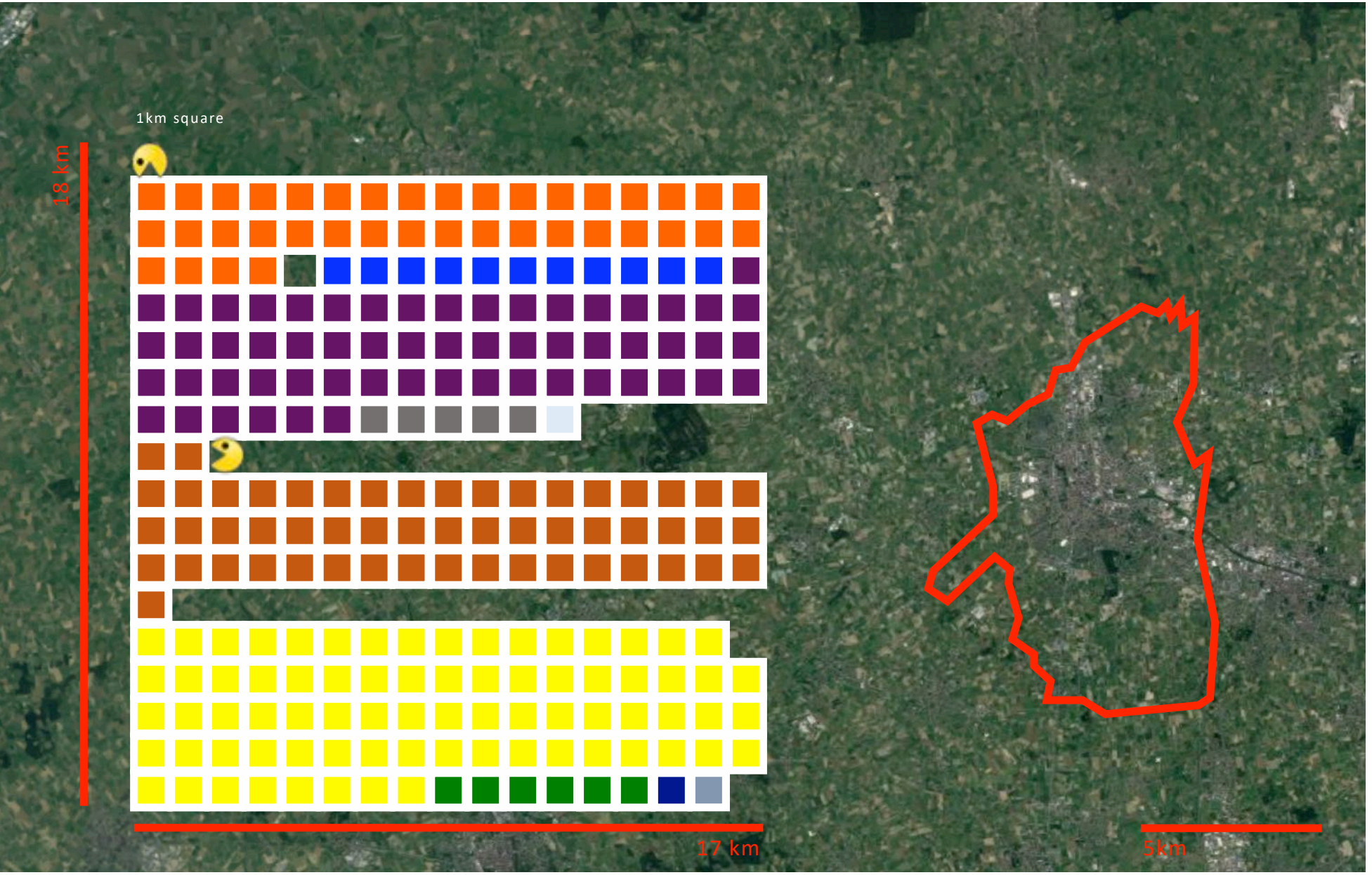
- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

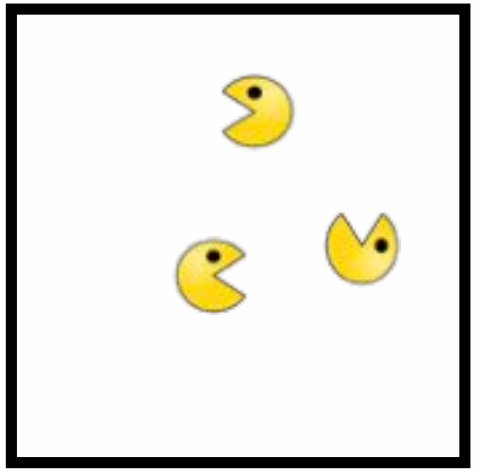
CITY-zen
New urban energy

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #3
DISTRICT HEATING NETWORK
Waste incineration

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

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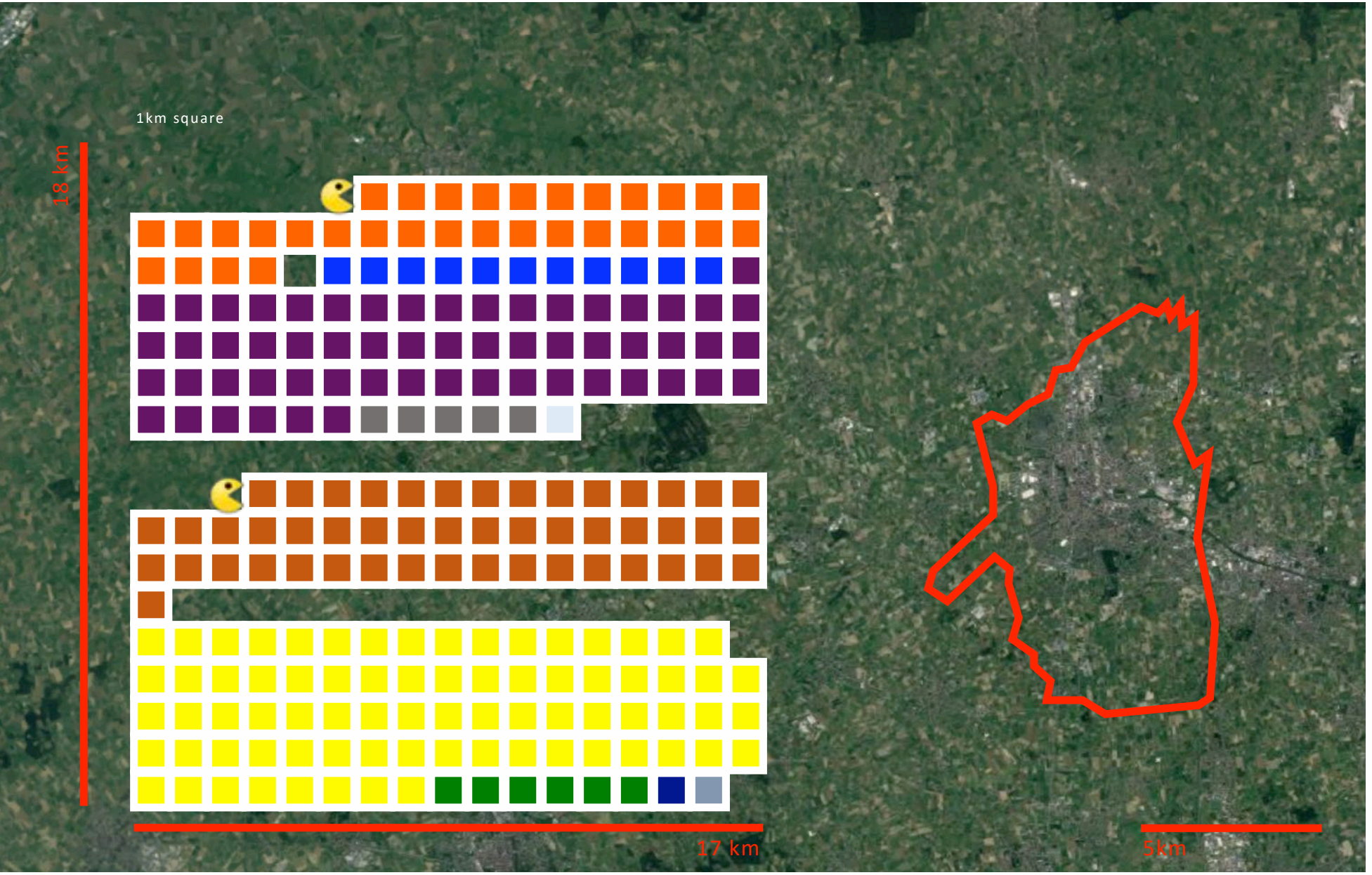
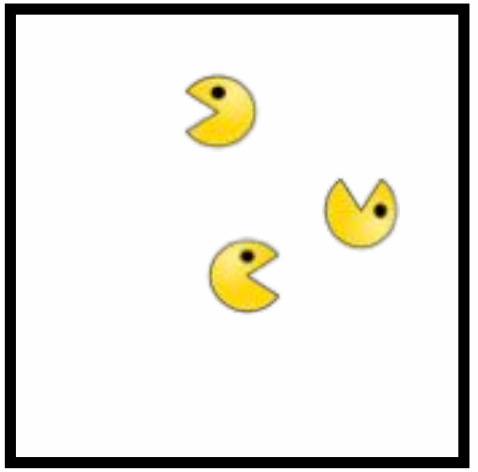
CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #4
DISTRICT HEATING NETWORK
Solar collectors + HT storage

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

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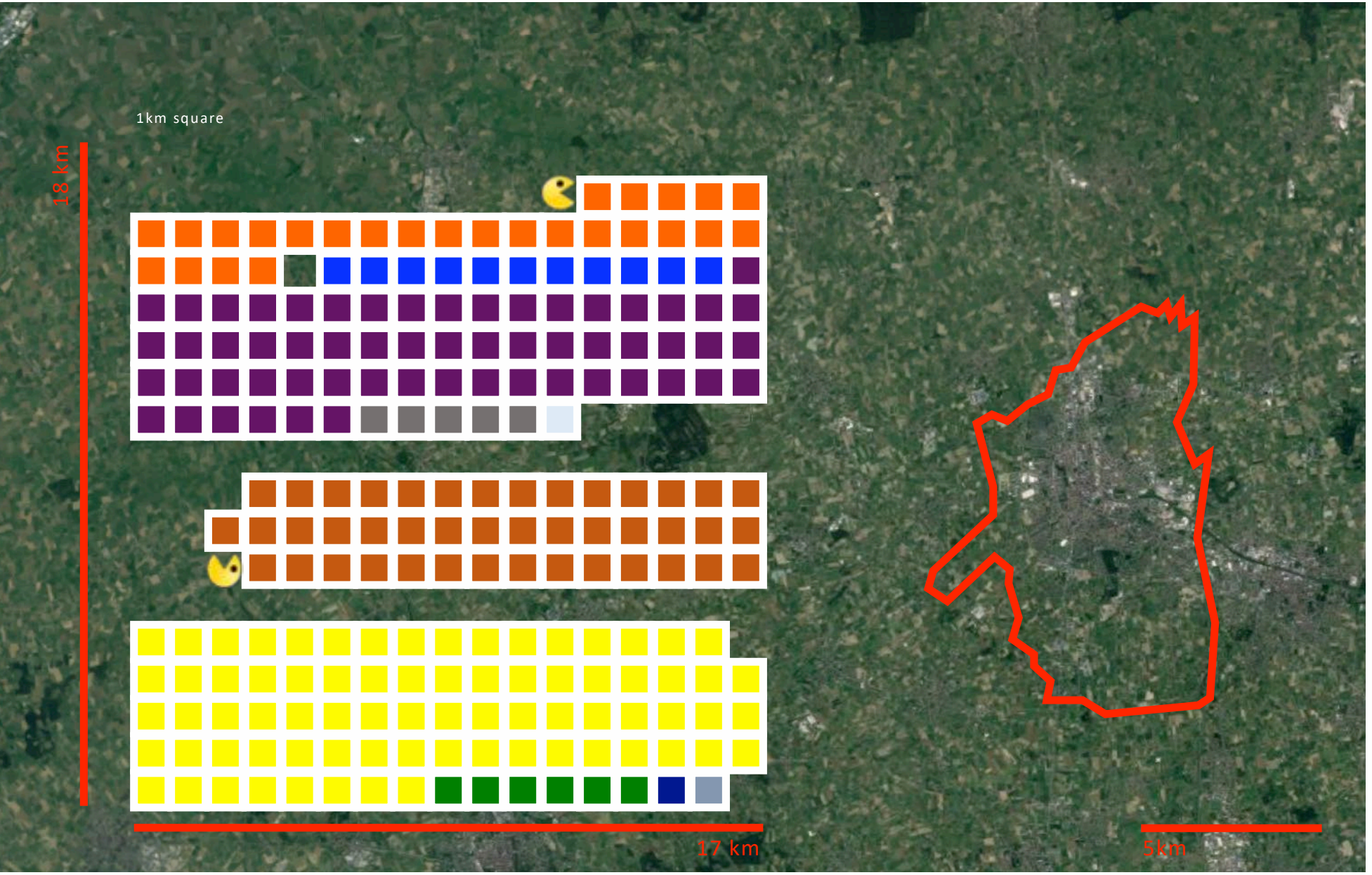
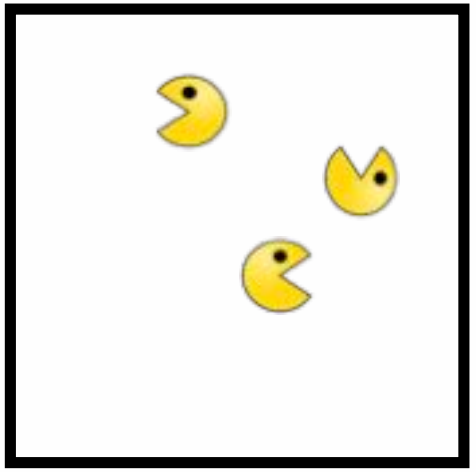
CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #5
DISTRICT HEATING NETWORK
HT industrial waste

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

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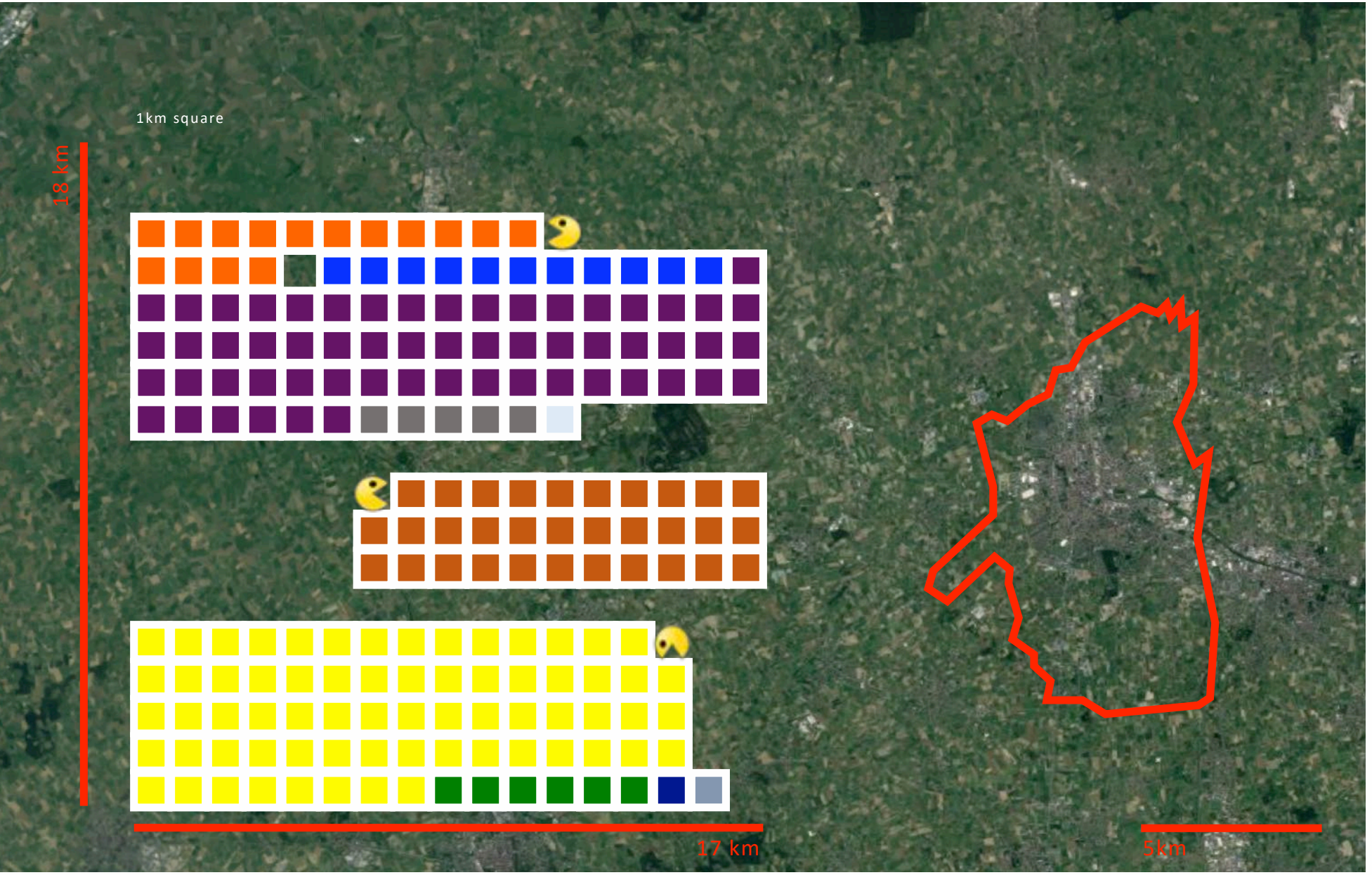
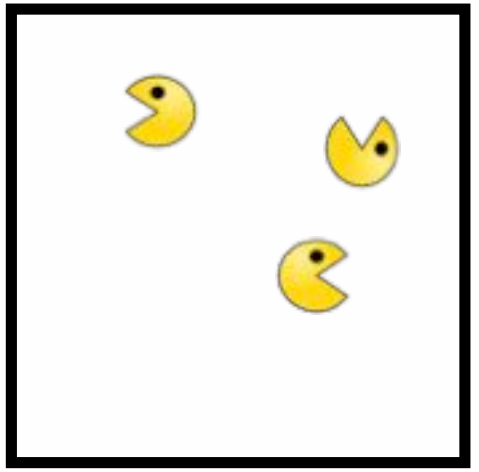
CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #6
MINI HEAT GRIDS
Solar collectors + MT storage

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

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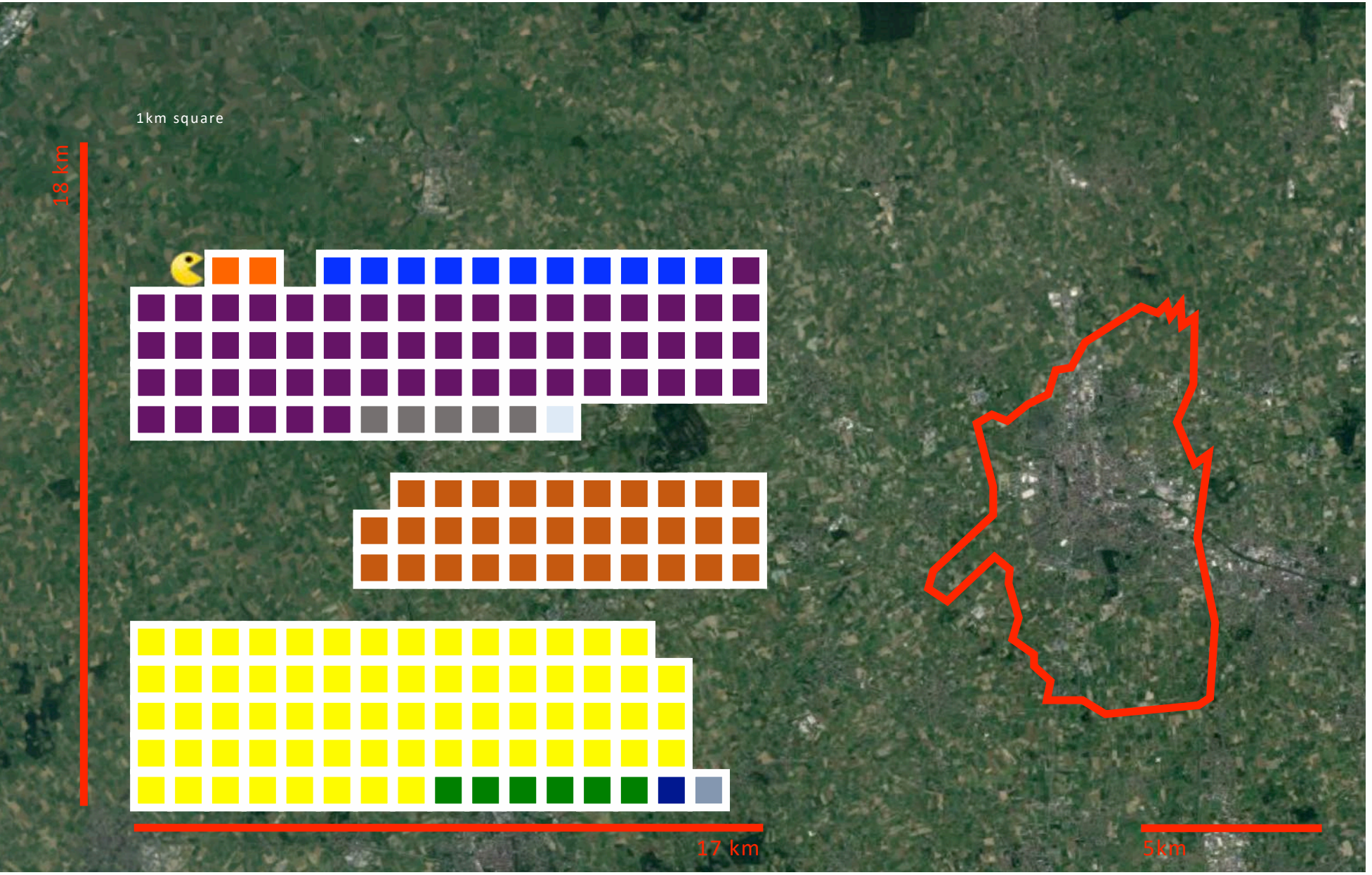
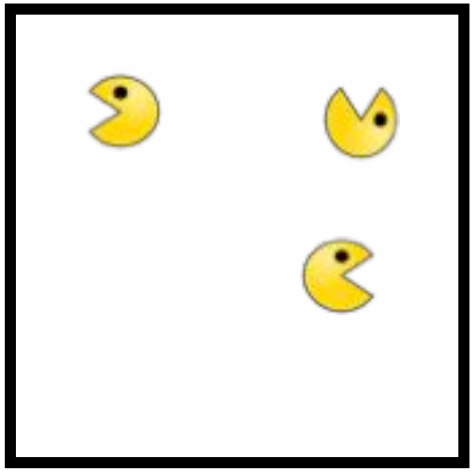
CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #7
PV THERMAL
Individual or blocks

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

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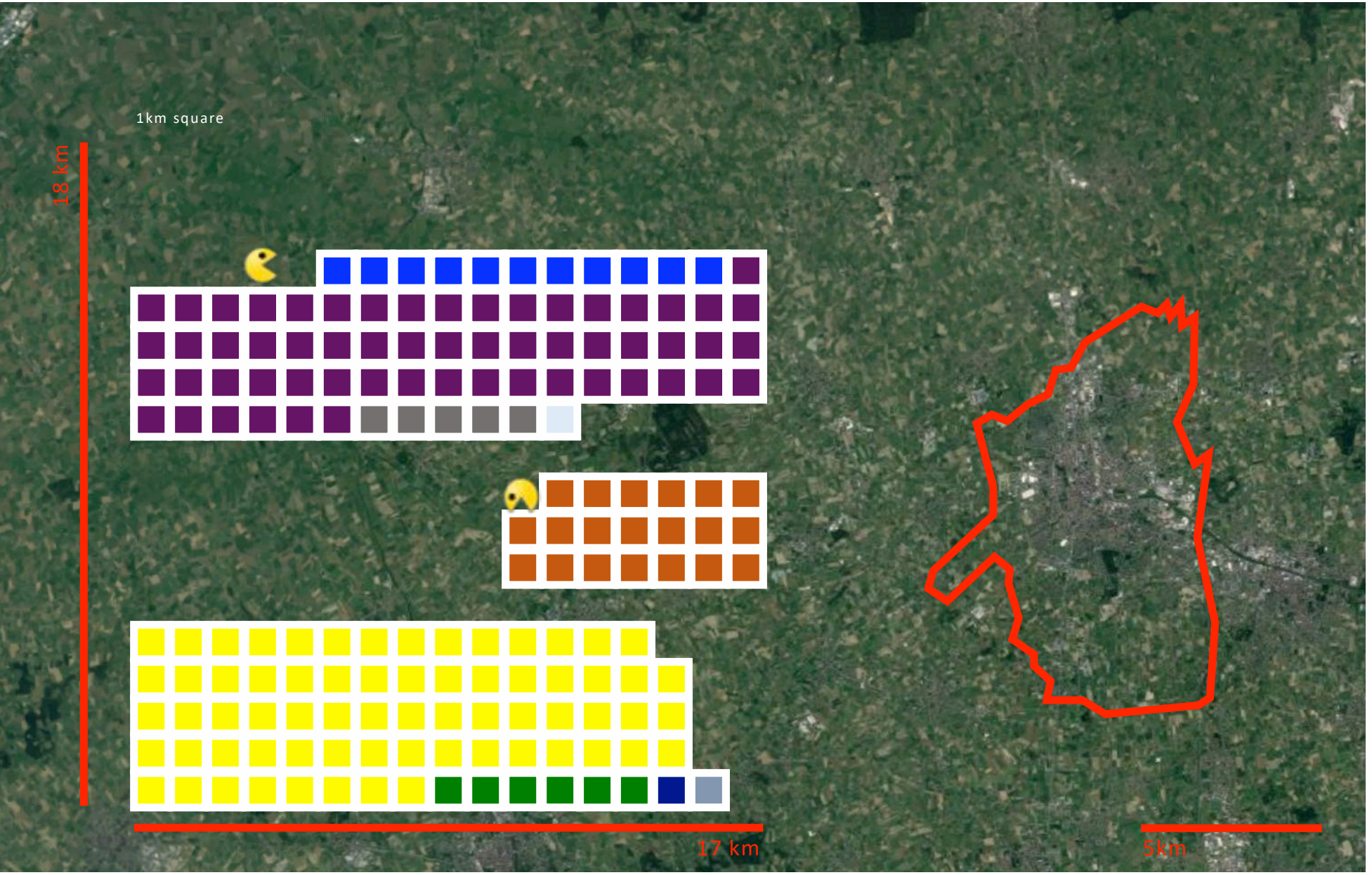
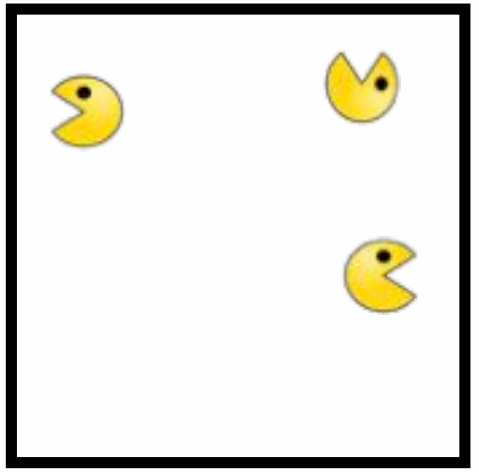
CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #8
LT MINI HEAT GRID
LT ATES Aquifer Thermal Energy Storage

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

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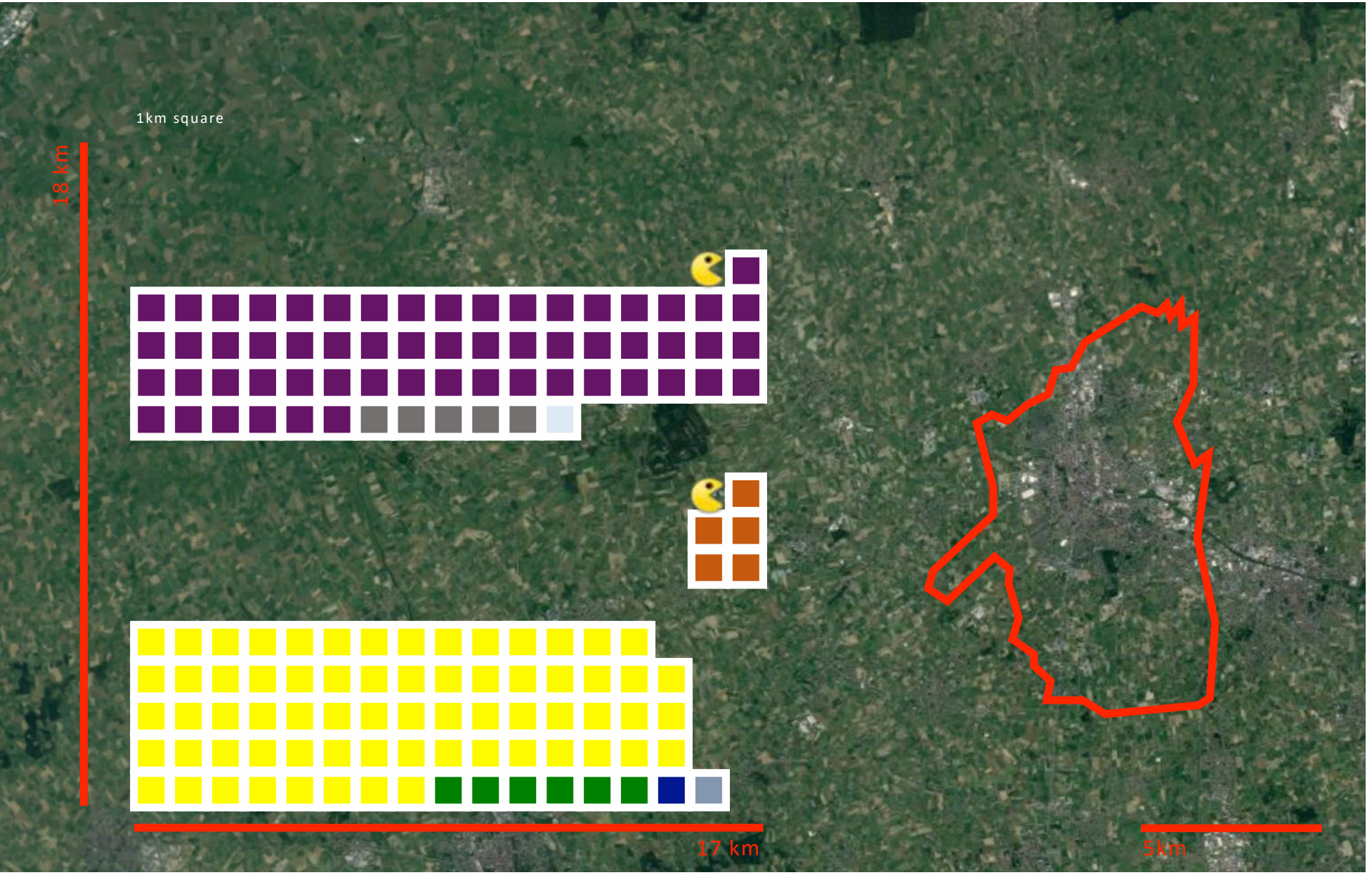
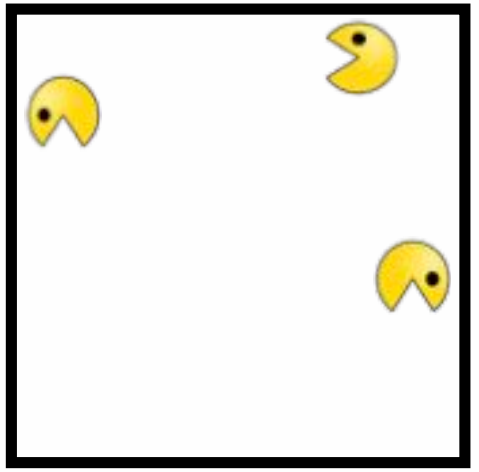
CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #9
PV on ROOF

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

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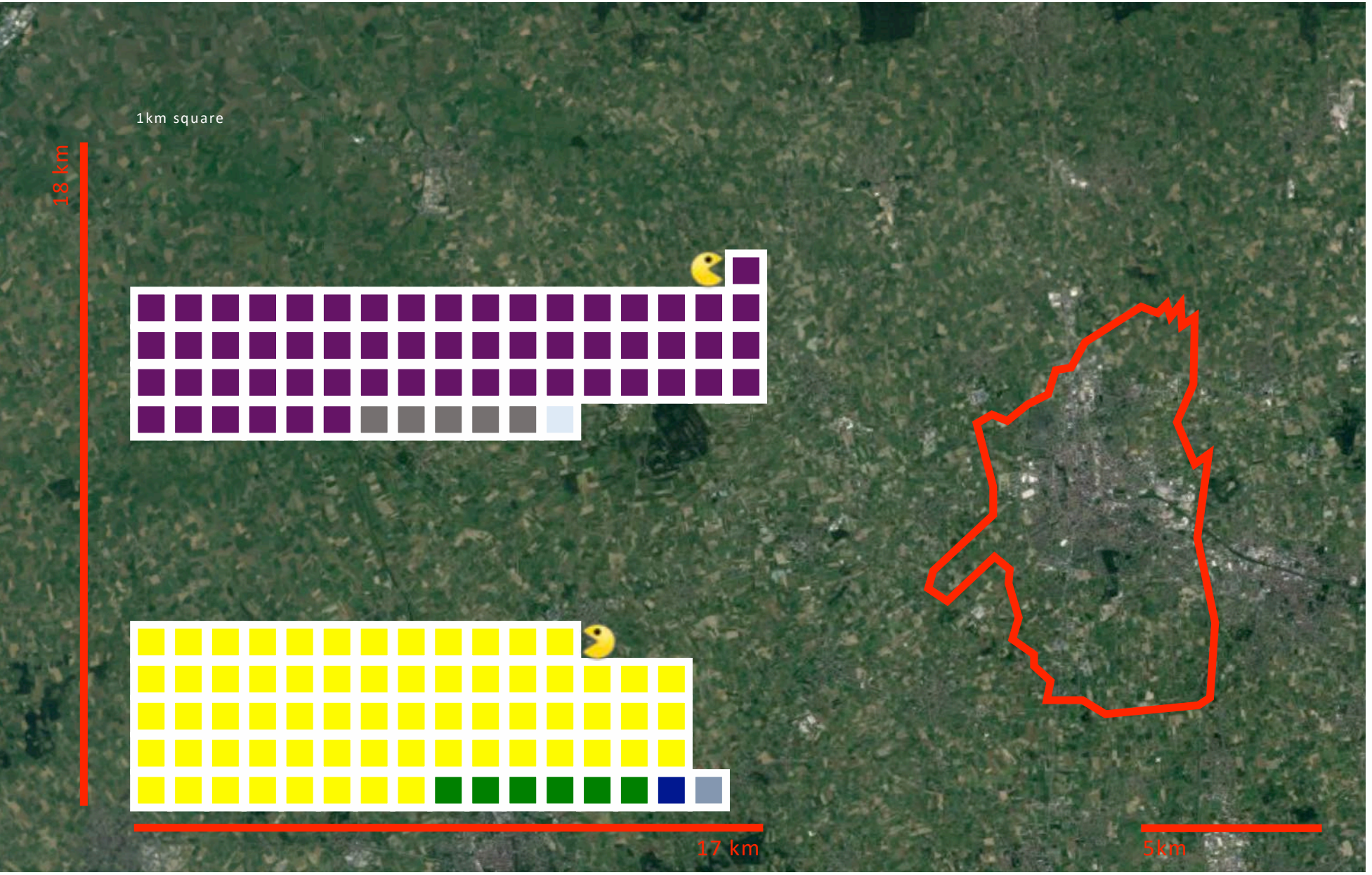
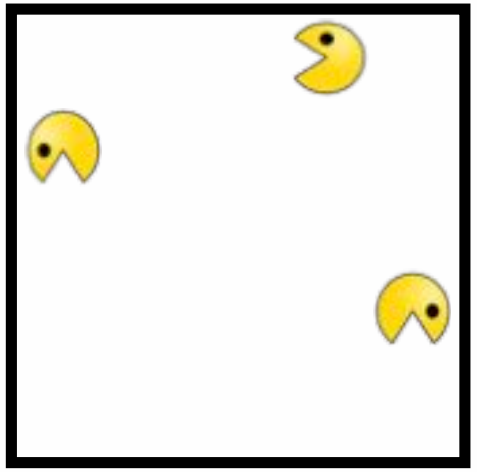
Roeselare, Belgium. April 2018

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #9
PV non ROOF

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

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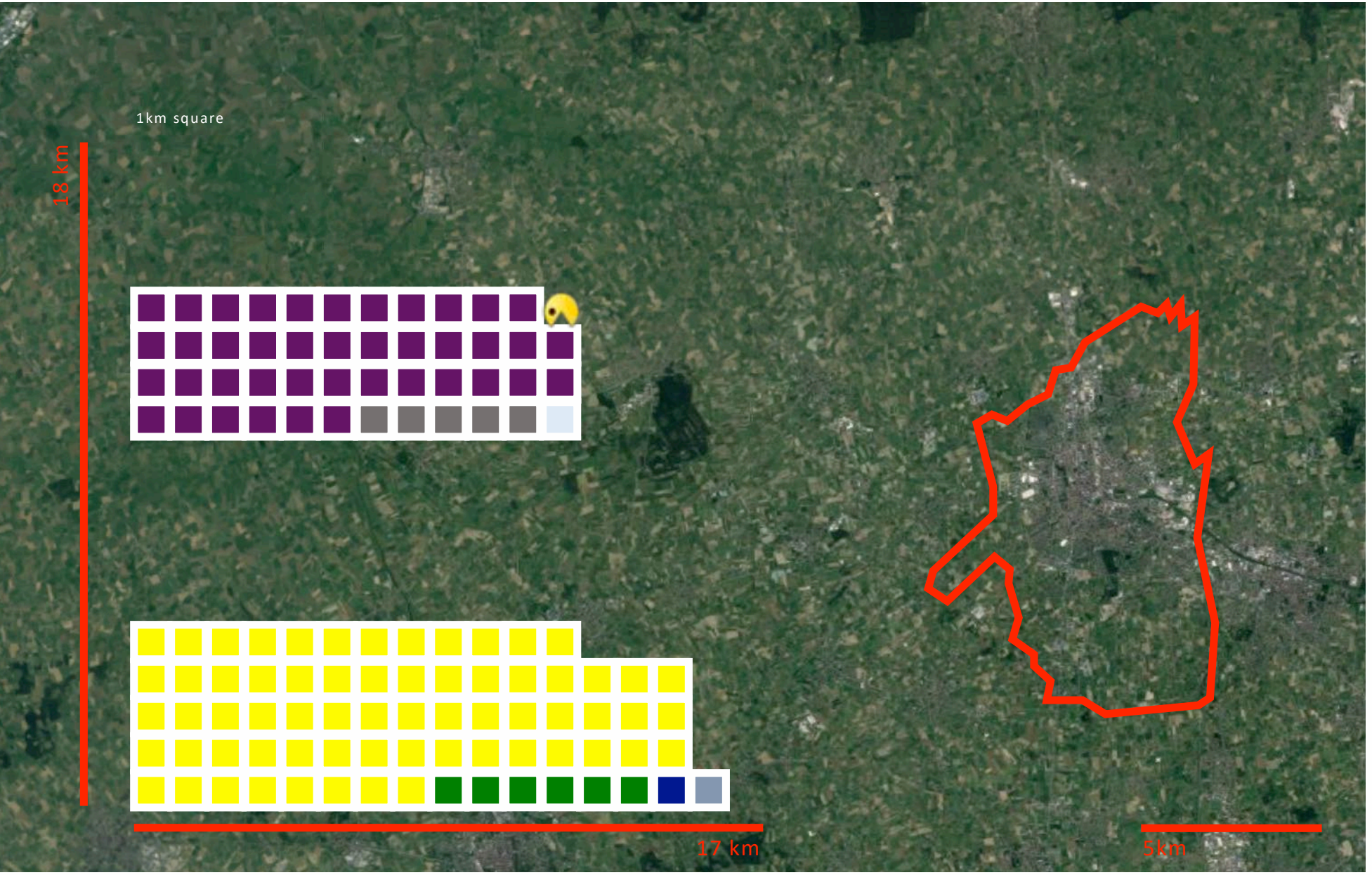
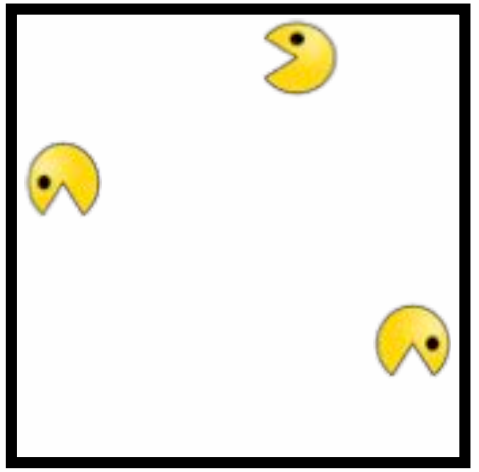
CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #10 SUSTAINABLE MOBILITY

Cycling roads, electric public/sharing

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

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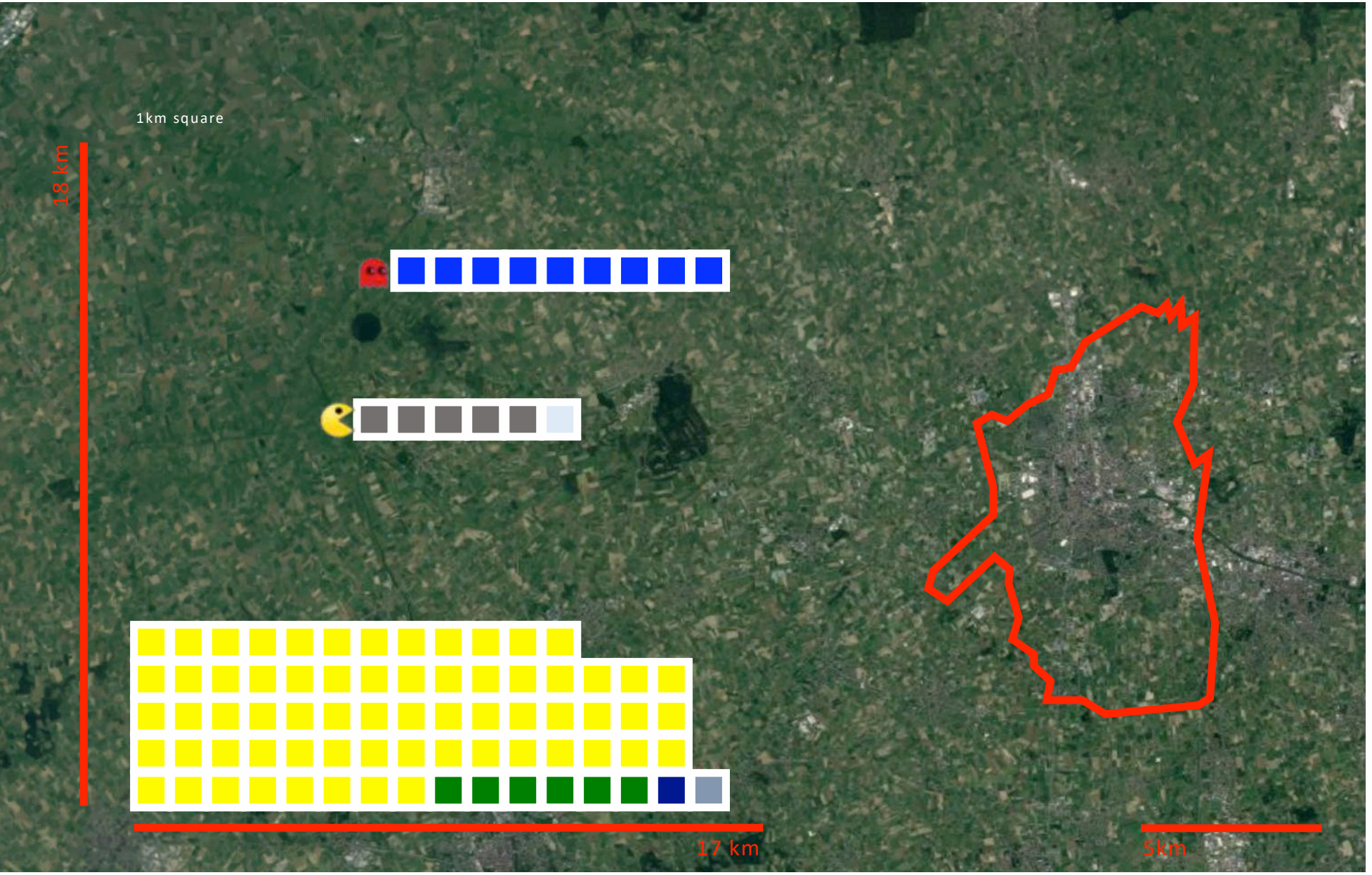
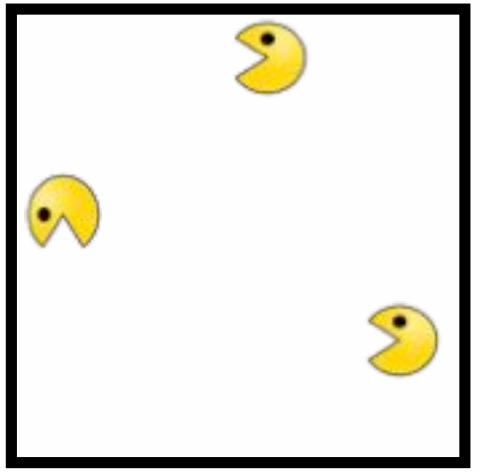
CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #11
TRANSITION TO ELECTRIC MOBILITY

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

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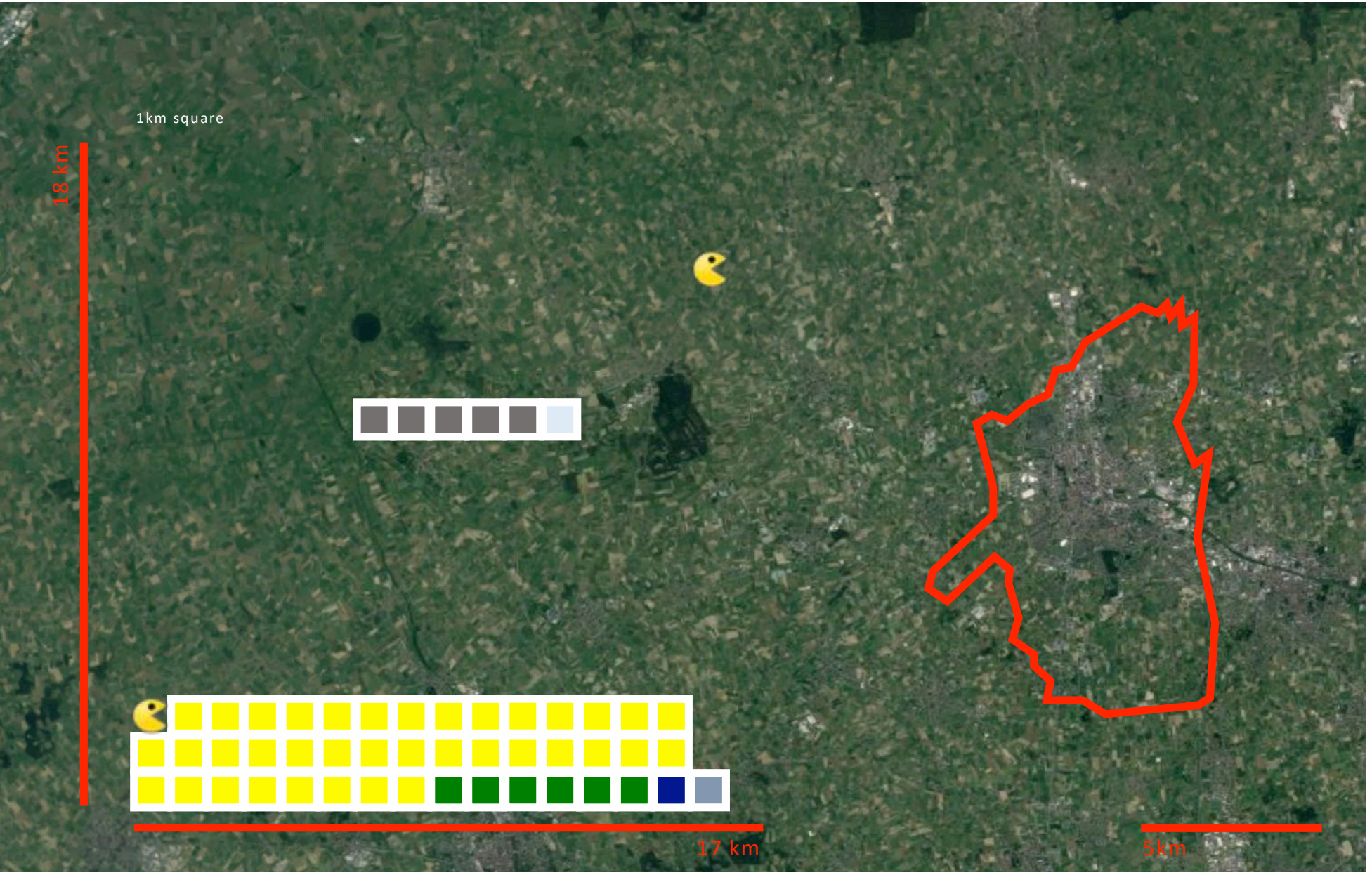

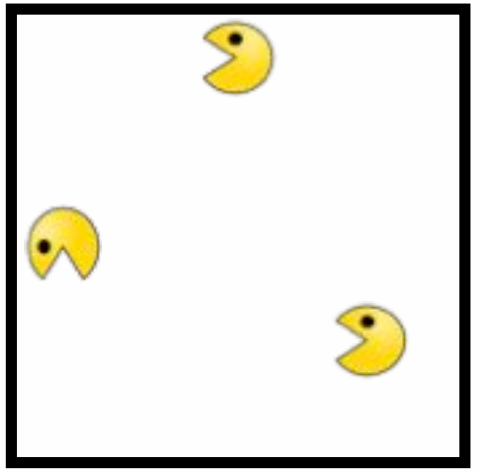

MEASURE #12
WIND FARM

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

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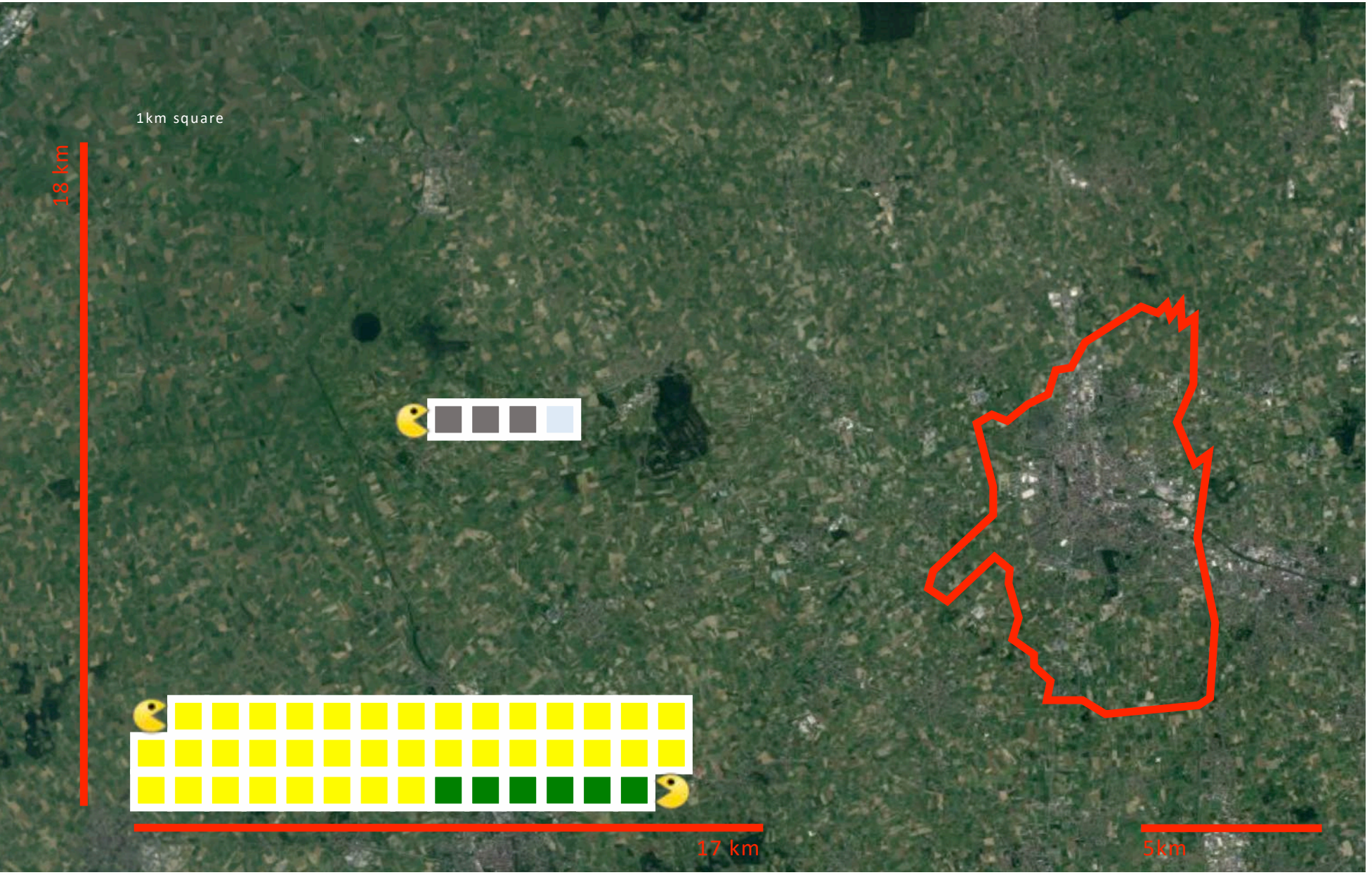
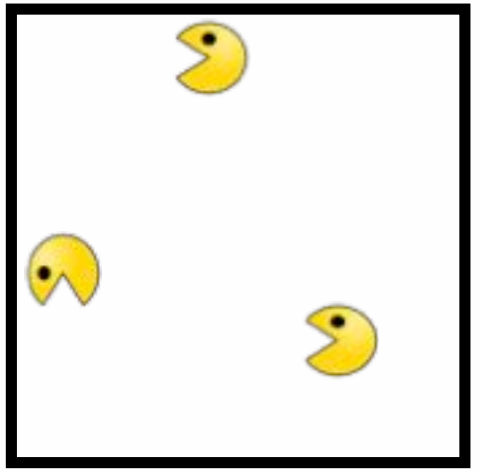
CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #13
Waste recycling %
LED public lights
Electric public transport

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

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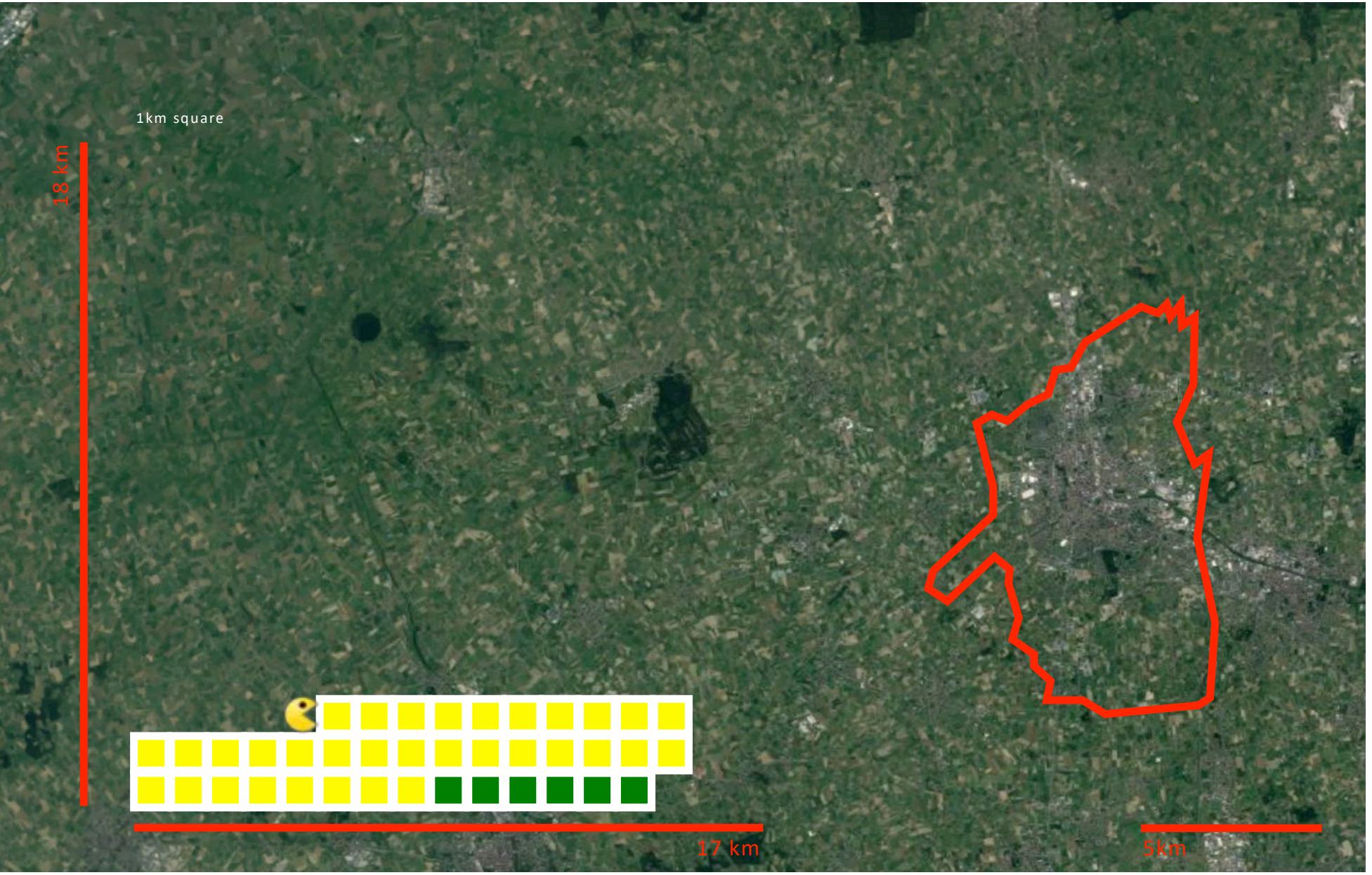
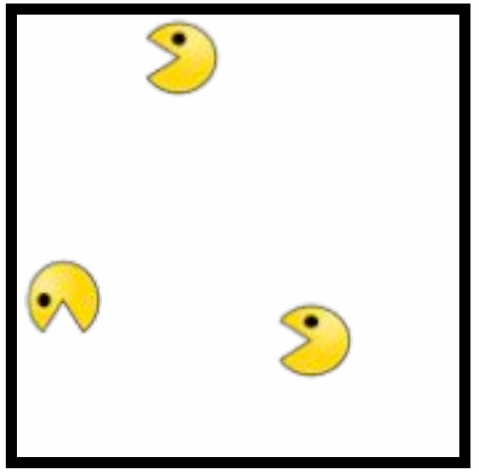
CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #14
URBAN FORESTRY

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

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New urban energy

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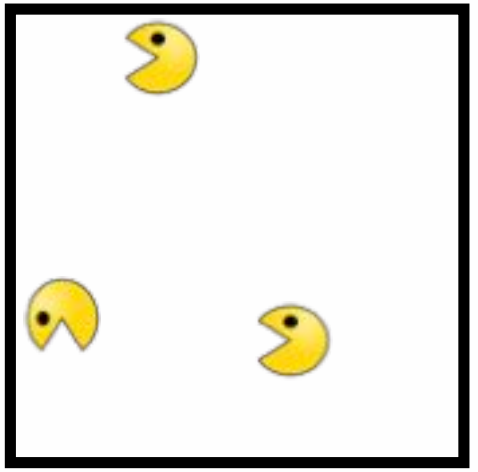
CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE



MEASURE #15
NEW FOREST

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

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Nu is’t aan junder, veel succes!

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